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SAN FRANCISCO

SAN FRANCISCO CITY PLANNING COMMISSION

DRAFT ENVIRONMENTAL IMPACT REPORT

APPENDICES

SAN FRANCISCO AIRPORT EXPANSION

SAN FRANCISCO INTERNATIONAL AIRPORT

EE 73.88

August 10, 1973

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APPENDIX A

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APPENDIX A

INDIVIDUAL PROJECT DESCRIPTIONS INCLUDED IN VARIOUS STAGES OF PROGRAM CONSTRUCTION

The Expansion Program is planned to be constructed in four stages, related primarily to expansion of passenger facilities.

STAGE 1

All of Stage 1 items were approved in October 1970. This stage provides new facilities for the international carriers and many support facilities. Completion by late 1973. At this period in time, there will be a total of 55 loading gates, of which 15 would be for wide-bodied aircraft. Design level is 17,400,000 annual passengers.

Project Descriptions

Boarding Area A

Construction of the 200-foot-diameter, three-level rotunda structure partially enclosed at ground level and fully enclosed at the second and third levels, finished in the public use areas, and including the first bay of the connector, and providing over 74,000 square feet of enclosed space. Cogs have been added on the second level to meet airline requirements. Construction contract awarded August 11, 1970, and work was 87% complete by July 1, 1973.

Fifth-Level Addition to Existing Garage

Construction of the 248,000-square-foot fifth level on the existing terminal garage, providing about 600 additional parking spaces. Completed.

Entry Roads Including West Underpass

Construction of new main entry roads and side service roads from Bayshore to the entrance to the terminal area, including construction of the West Underpass structure and a sewage lift station, and provision of utilities. Completed.

Terminal Roads and East Underpass

Construction of the two elevated three-lane roadways, the inner roadway running around the garage and the outer roadway consisting of an up-ramp to the South Terminal addition, replacement of the section between the South and Central Terminals, and extension from the Central Terminal past the projected North Terminal to and including the down-ramp; construction of the new East Underpass, paving of the lower terminal roads, and construction of six sewage lift stations, four pedestrian tunnel structures and pedestrian bridge foundations, and provision of utilities. An Environmental Impact Statement was approved for this project on March 3, 1971. Complete, except for section of Upper Loop in front of garage which was awarded February 20, 1973 and was 26% complete on July 1, 1973.

Taxiway B and Apron
Reconstruction of Taxiways B and A by moving out 100 feet between Taxiways M and D to provide additional apron required to accommodate the new generation of large jets. Completed.

Extension of Taxiway B and Apron
Extension of the new Taxiway B (A1) west from Taxiway D to provide additional clearance for 747 aircraft to pass at United's existing Pier b. Completed.

Taxiways G and L
Construction of Taxiway G and extension of Taxiway L to the south from G, providing a bypass taxiway to Runway 1R to eliminate congestion on Taxiway B. Completed.

South Terminal Apron Addition
Extension of the apron to the South Terminal to provide aircraft parking and circulation area to accommodate Boarding Area A. Completed.

Boarding Area A Apron
Reconstruction of the apron around Boarding Area A, because of the new location and design of the structure, to provide adequate pavement and drainage. Completed.

Taxiways D, E, F, and G Lighting
Installation of taxiway centerline lighting in accordance with new criteria established by the FAA. Completed.

Centerline Taxiway B Lighting
Installation of centerline lighting on the new Taxiway B in accordance with new FAA criteria. Completed.

Remote Transmitter Facility
Relocation of the air-traffic control remote transmitters off Plot 40 to a new location at the north end of Taxiway P. Completed.

Cargo Building No. 7
Construction of Cargo Building No. 7 to accommodate the increasing demand for cargo space by the airlines and to provide replacement space for Cargo Building No. 1, demolished for construction of the North Terminal. Completed.

North Airport Fill
Fill at the northern limit of airport land to provide approximately 60 acres of additional property for the expansion of cargo facilities and for airport facilities such as the airport water quality control plant. Completed.

West of Bayshore Fill

Fill west of PG&E transmission lines on West of Bayshore property to begin preparing approximately 50 acres of airport land for construction of airport support facilities, such as airlines commissaries, rental car service, and parking. Completed.

West of Bayshore Power Substation

Construction of a power substation, located west of Bayshore and south of the San Bruno interchange, to provide additional power for the airport and also to serve as a backup major power service to the main airport substation located adjacent to the airport entrance. Completed.

Sewage Treatment Plant

Construction of a new 2.2 mgd secondary sewage treatment plant north of the seaplane harbor, to meet new effluent quality standards and to prepare for the expansion of the airport. Completed.

Influent and Effluent Lines to Sewage Plant

Extension of sewage pipelines to the new sewage plant and construction of a new effluent line to discharge offshore from the seaplane harbor. Completed.

Utilities to Sewage Plant

Provision of power, water, and telephone utilities to the new sewage treatment plant. Completed.

STAGE II

The projects which are tentatively planned for inclusion in stage II would provide a new North Terminal and new remote boarding areas (H&I) off this terminal, an addition to the central garage and other support facilities. This stage is divided into two parts: Stage IIa contains those projects on which construction has already started, and Stage IIb contains those Stage II projects where construction has not started. Completion by early 1976. On completion, there will be 72 loading gates, of which 29 would be for wide-bodied aircraft. Design level is 24,400,000 annual passengers.

Project Descriptions

Stage II a

Runway 28R Extension

This project was started in August 1967 when a contract was awarded for the fill necessary for the extension. This surcharged fill was completed in August, 1969, and has been awaiting the accelerated settling from the surcharge before paving. The project extends Runway 28R and its parallel taxiway approximately 2500 feet to the east. It develops the runway system for the lowest landing weather minimums. Airport Development Aid Program funds have been made available for

partial financing of this project after acceptance of a negative environmental impact report. Paving of the extension is scheduled for award in August 1973.

North Terminal Structure

The North Terminal Structure is divided into five projects and will not be usable until all of them are completed. These include the foundations, the structures, the aprons, the remote boarding areas and the Central Heating and Cooling Plant. The boarding areas are vital, since the aircraft service facilities for the entire terminal are located under them. The facility was approved on October 20, 1970 and construction began with the award of the contract for the foundations on February 2, 1971. That $6 million contract was 98% complete on July 1, 1973. During construction of foundations, design has proceeded on other phases of facility. The five projects are:

North Terminal Foundations

Construction of the 160,000-square-foot basement structure, including first-level slab, for the foundation for the North Terminal, with utilities roughed in but excluding any finish work. 98% complete July 1, 1973. Cost $6,113,000.

North Terminal Structure

Completion of the North Terminal Structure including:

- Extension of each end of basement under frontal gates and extension of the building basement at the west end.

- Construction of the complete superstructure, including first level other than slab, second and third levels, canopy, and roof designed for parking.

- Construction of two pedestrian bridges connecting Superstair Complexes to the garage, with structural provision for People Mover System.

- Finishing of basement constructed in previous project.

- Finishing of two pedestrian tunnels connecting the Superstair Complexes to the garage.
- Construction of service road on a structural slab beneath the frontal gate holding rooms along the full length of the North Terminal.
- Construction of a sidewalk-canopy structure, with crawl space below lower sidewalk to the Central Terminal Building.
- Construction and finishing of the sidewalk structures along the upper and lower terminal roads along the main North Terminal building.

Boarding Area H & I and Connector
Construction of a second-level satellite boarding area and partially enclosed ground floor level, providing approximately 226,000 square feet of enclosed area, including a 520-foot-long second-level connector to the North Terminal, with structural provisions for a People Mover System.

North Terminal Aprons
Provision of aprons for the new North Terminal building and Loading Facilities H and I.

Central Heating and Cooling Plant
A combined central heating and cooling plant is planned for construction in the new garage addition to serve the entire Terminal area. From this plant, high temperature hot water and chilled water will be piped to heat exchangers in the Terminal Building.

Runway 19L Hi-Speed Exit
Provision of a high-speed exit near the south end of Runway 19L to increase its landing acceptance rate and to eliminate interference with the instrument landing system caused by aircraft just landed. A separate Environmental Impact Statement was approved for this project on March 20, 1971, and Federal funds were granted to partially finance it. Contract awarded Jan. 26, 1973. 70% complete July 1, 1973.

Replace Present Sanitary Sewers
Replacement of present sanitary sewers to increase capacity and to provide the greater pressure strength necessary to feed to influent line of the new sewage treatment plant. One segment of line was completed March 8, 1973 and the last section was awarded June 19, 1973.

Stand-by Power, Sewage Plant
Provision of a 500-kva stand-by power generation unit at the Sewage Treatment Plant with capacity to run the plant in the event of outage of the usual power supply and prevent bypassing; in conformance with Federal requirements. This project approved in Oct., 1970, was put under contract April 3, 1973 and was 5% complete July 1, 1973.

Deep Water Outfall, Sanitary
Construction of an effluent link from the sewage plant to a deep-water sanitary outfall to be shared with the South San Francisco/San Bruno Sewage Treatment Plant, including the airport's share of the cost of the extension of their existing outfall to 4,000-foot lengths; in conformance with Federal requirements. Contract awarded April 3, 1973, and was 52% complete July 1, 1973.

Stage II b

Noise and Air Pollution Monitoring Program
Perform the required initial noise study and provide the necessary noise monitoring system in areas adjacent to the airport, in accordance with State Law. Purchase and install equipment to measure air pollutant fallout along flight patterns.

Industrial Waste Plant
Construction of a water treatment plant in the north airport fill area to treat industrial wastewater from aircraft washing bays, apron, and similar areas. Designed to produce an effluent meeting standards of the water quality control board.

Industrial Waste - Force Mains
Construction of pressure pipelines required to convey wastewater from catch basings to the industrial waste treatment plant.

Industrial Waste - Pump Station
Construction of pump stations required to pump industrial waste from catch basings to the industrial waste treatment plant.

Airport Maintenace Facility
Consolidating maintenance facilities into a complete complex providing shops, control center, vehicle maintenance facility, centralized supply, corporation yard, lunchroom, washroom, and locker facilities with employee parking.

Garage Addition - Structure
Construction of a five-level addition to the existing garage, increasing the parking capacity by about 4,300 to a total of 7,300 cars, including:

- Construction of two automobile ramps for vertical circulation between all levels.
- Creation of a 200-foot central open space with a landscaped plaza around the control tower column at the first level.
- Installation of parking and traffic monitoring and control system to assure maximum utilization of parking facilities.
- Construction of four vertical transportation cores.

Garage Addition - PMS Structure
Provision of support structure in the garage addition for People Mover Systems and stations on the three radials serving the North Terminal and Boarding Area H-1, Boarding Area G, and Boarding Area A.

Interline Baggage Tunnel
Provision of perimeter baggage/utility tunnel below first-level slab of garage addition and existing garage to permit passage of utility distribution mains from the central supply facilities and to provide for possible future installation of an interline baggage system.

Utility Distribution
Installation of utility mains from central supply facilities to the Terminal Complex facilities.

Control Tower and Ring
Construction of a nominal 200-foot-high column to support FAA-supplied control tower, plus concession space, observation platform, and FAA facilities located immediately beneath the control tower cab.

BART Access
Structural provisions in foundations of garage addition to permit future construction of BART line and station below first level.

Existing Garage - Modifications

Implementation of necessary modifications to the existing garage structure to accommodate the addition of the new structure and to integrate the vertical transportation cores with the revised passenger transportation concept. This includes modifications of the existing foundations, demolition of the two existing vertical pedestrian transportation cores and replacement with three new stair and elevator cores, removal of existing automobile ramps, removal of existing exterior screen and replacement with balustrade facade to match new addition. There will be additional structural modifications as necessary to accommodate the remodeling and the sixth-level Passenger Distribution Center additions.

Existing Garage - PMS Structure

Provision of increased strength in the existing garage structure to permit installation of People Mover Systems and stations on the three radial lines serving the South Terminal and Boarding Areas B-C, Boarding Area D, and the Central Terminal and Boarding Areas E-F.

Southeast Court Parking Deck

Provides for construction of temporary second-level parking structure in the present Southeast Court, providing approximately 35,000 square feet of parking space for short-term terminal parking.

South Terminal West Addition

Extension of South Terminal Building from the existing wall westward, providing a Superstair Complex for Boarding Area A, and an additional 63,000 square feet of public use and rentable space for the international airlines and concessionaires. Project includes:

- Construction of additional basement, a ground, second, and third level, a canopy and a roof designed as a parking area.

- Construction of a pedestrian bridge connecting Boarding Area A Superstair Complex with the Ground Transportation Center, with structural provisions for the People Mover System.

- Completion of the pedestrian tunnel connecting the above Superstair Complex to the Ground Transportation Center.

- Construction of sidewalk structure between terminal and terminal roads at upper and lower levels for the entire length of the extension.

Connector A

Construction and finish of a 480-foot-long second-level connector from the South Terminal to Boarding Area A, including a separate international arrival corridor and structural provisions for a People Mover System.

Fire-Crash Building

Expansion of No. 1 Crash House to accommodate additional equipment and manpower.

Runway 28R - Hi-Speed Exit

Provision of a high-speed exit taxiway from the extended Runway 28R to increase the runway landing acceptance rate.

Runway Drains 28R and 28L

Provision of pump stations and discharge lines to pump drainage water from Runway 28R and 28L into the Bay, replacing the present gravity drainage system, which has proved inadequate during high tides.

Runway Drains 19R and 19L

Provision of pump stations and discharge lines to pump drainage water from Runway 19R and 19L into the Bay.

Extend Taxiways A and B to 10R

Extension of Taxiways A and B to the western limit of Runway 10R to improve taxiway circulation and permit use of full length of the runway.

Relocation of Standard Oil Hangar

Construction of a new hangar on Plot 18 adjacent to the Seaplane Harbor, to be occupied by Standard Oil in trade for their current hangar adjacent to Cargo Building No. 7; and conversion of the existing hangar for cargo purposes to accommodate those displaced from demolished Cargo Buildings Nos. 2 and 3.

Increase Frontage Roads to Four Lanes

Reconstruction of the frontage roads between Millbrae Avenue and San Bruno Avenue to increase capacity to four lanes throughout. Jointly sponsored improvements to intersections of Frontage Road with Millbrae Avenue and San Bruno Avenue.

North Access Road

Construction of a new road to service the new property created by the North Airport Fill.

STAGE III

The projects which are tentatively planned for inclusion in Stage III would provide new frontal gates along the Northeast and Southeast Courts, modify the existing Central Terminal, and replace existing remote boarding areas with others designed for operations with wide-bodied aircaft. On completion, there will be 73 loading gates, of which 45 will be for wide-bodied aircraft. Design level is 27,000,000 annual passengers. Completion by 1979.

Project Descriptions

East Terminal Additions and Modifications

Additions to and remodeling of the Central Terminal Building, including:

- Addition of frontal gates on field side to match new construction and minor remodeling of exterior.
- Construction of pedestrian bridge connecting the Central Terminal Superstair Complex with the Ground Transportation Complex, with structural provision for the People Mover System.
- Create a Superstair Complex, including necessary structural alterations to receive the pedestrian bridge from the Ground Transportation Complex and provision for a People Mover Station.
- Remodeling of existing pedestrian tunnel to the Ground Transportation Complex.
- General remodeling of first, second, and third levels to new terminal standards but excluding any structural alterations for airline automated baggage handling equipment.

- Demolition of existing control tower and necessary refinishing of areas disturbed.

- Service road connection between northeast and southeast frontal gates.

Northeast Frontal Gates
Construction of frontal gates between the Central Terminal and the North Terminal consisting of second-level frontal gate holding rooms and concourse, with a service road beneath frontal gate holding rooms on a structural slab.

Southeast Frontal Gates
Construction of frontal gates between the Central Terminal and the South Terminal east addition, consisting of second-level frontal gate holding rooms and concourse, with a service road on a structural slab beneath frontal gate holding rooms.

Boarding Area E-F and Connector
Construction of a second-level central concourse and two second-level satellite boarding areas, providing approximately 67,000 square feet of enclosed space. There will be 100-foot-long connecting corridors between the boarding area and the main concourse, a 400-foot-long second-level connector to the Central Terminal, and structural provisions for a People Mover System on the new connector.

Passenger Distribution Center
Construction at the sixth level of a Passenger Distribution Center structure, including supports to facilitate access to the six radial access bridges to the various terminal buildings,and finishing of all public areas and installation of PMS stations.

Northeast Court Parking Deck
Provides for construction of temporary second-level parking structure in the present Northeast court, providing approximately 35,000 square feet of parking space for short-term terminal parking.

East Terminal Aprons
Reconstruction of the aprons along the Southeast, Central and Northeast Terminals to provide for the frontal gate positions and for the new Loading Facilities E and F.

Boarding Area G and Connector
Construction of a second-level satellite boarding area providing approximately 29,000 square feet of enclosed space. There will be a 400-foot-long, second-level connector for the North Terminal with structural provision for a People Mover System.

West of Bayshore Utilities and Roads
Provision of utilities and roads necessary for the development of the property prepared as a result of the West of Bayshore Fill.

Administration Building
Construction of a multistoried facility on Lot B, with exterior appearance matching Rental Car Facilities on opposite side of entrance road. Top floor for Airport Administration, other floors for employee parking.

Automatic Control Equipment
Control systems for sensing and automatically reporting to a central control room conditions of security, fire control systems, communications systems, traffic, parking, vertical transportation systems, noise abatement, and airfield and road lighting. Provides more efficient operations with less manpower.

Overpass to West of Bayshore Property
Construction of an overpass to connect the West of Bayshore property directly with the main airport area, to be located just south of the Bayshore Airport interchange, and connecting to Road R2 immediately south of Hilton Hotel. (To be financed and constructed by California Highway Commission.)

STAGE IV

The projects which are tentatively planned for inclusion in Stage IV would provide for enlarging and building frontal gates along the present South Terminal, and replacing two existing remote loading areas with ones designed for wide-bodied operations. On completion of this stage, there will be 80 loading gates, of which 53 would accommodate the larger aircraft. Design level is 31,000,000 annual passengers. Completion by 1982.

Project Descriptions

South Terminal East Addition

Extension of South Terminal building from existing east wall eastward to provide for Superstair Complex for Boarding Area D, including:

- Construction of additional basement, ground, second, and third levels, canopy and roof designed as parking area.

- Construction of a pedestrian bridge connecting the Boarding Area D Superstair Complex with the Ground Transportation Center, with structural provision for the People Mover System.

- Completion of the pedestrian tunnel connecting the above Superstair Complex to the Ground Transportation Center.

- Construction of a sidewalk-canopy structure with crawl space below lower sidewalk to Central Terminal. building.

- Making minor changes in South Terminal to accommodate connection of Superstair.

- Construction of sidewalk structure and finish between terminal and terminal roads at upper and lower levels for the length of the extension.

South Terminal Additions and Frontal Gates

- Construction and finishing of basement, first, second, and third levels; and roof additions at west and east ends.

- Construction of additional basement.

- Construction and finishing of frontal gate holding rooms and frontal gates at second level.

- Construction of service road on a structural slab beneath the frontal gate holding rooms along the full length of the South Terminal.

South Terminal Modifications

Remodeling of the interior of the South Terminal, including:

- Construction and finishing of the Boarding Area B-C Superstair Complex, including necessary structural alterations to receive the pedestrian bridge from the Ground Transportation Center and provision for a People Mover System. station.

- Remodeling of the existing pedestrian tunnel to the garage structure.

- Conversion of space vacated by steam plant to operations or rental areas.

- General remodeling of finish and mechanical and electrical work to new terminal standards but excluding any structural alterations necessary for airline automated baggage handling equipment.

- Modification of facade to match North Terminal facade.

Boarding Area B

Construction of three-level building similar to Boarding Area A, plus a second-level concourse with frontal gates joining it to Connector B-C, all providing approximately 84,000 square feet of enclosed space.

Connector B-C

Construction and finishing of a 540-foot-long second-level connector from the South Terminal to Boarding Area B-C, including structural provisions for a People Mover System and station.

Boarding Area D and Connector

Construction of second-level satellite boarding area providing approximately 29,000 square feet of enclosed space. There will be a 400-foot-long second-level connector to the South Terminal with structural provisions for a People Mover System.

Rental Car Facilities
Construction of multi-level parking, service, and administrative facilities for car rental agencies; all located on present Parking Lot A on the south side of the entrance road.

South Terminal Aprons
Reconstruction of the aprons along the South Terminal building to provide for the frontal gate positions and for the new Loading Facility D.

Boarding Area B Apron
Reconstruction of the apron around new Loading Facility B to provide adequate pavement and drainage.

The following projects, included in the Expansion Program, will be provided incrementally during the previous stages as required:

People Mover System equipment

Terminal Furniture

Demolition of existing facilities

Art requirements

Grading, irrigation and planting

APPENDIX B

APPENDIX B

SYNOPSIS OF PUBLIC HEARINGS CONDUCTED BY THE REGIONAL AIRPORT SYSTEMS STUDY COMMITTEE

The purpose of these hearings was to receive from agencies and the public response to the technical material prepared to date, to allow additional information to be added to the record, and to receive an insight into opinions and concerns about present and future aviation development in the region.

The Regional Airport Systems Study Committee (RASSC) had originally scheduled three public hearings in the Bay Area — North, Central, and South Bay. In response to requests from San Francisco and Marin counties, two additional hearings were added. The following is a summary of these hearings:

Fairfield — November 15, 1971

Speakers included local city and county officials, and representatives from an airport, an airport land use commission, a public works department, an industrial development agency, Travis Air Force Base, and the State Department of Aeronautics. Approximately 80 people attended.

Most speakers favored development of northern Bay airports as part of a regional airport system because of land available and favorable location for handling growth. For Solano County, it was suggested that there would be a tolerance of airports because of the community's acceptance of Travis. A Travis/Meridian Airport was advocated, with civilian operations on a runway parallel to the existing runway and use of Travis' air traffic control tower. A representative of the Base Commander at Travis stated that although limited civilian use had begun, plans were that military use would not be phased out. Testimony also indicated opposition to any joint use that would interfere with the military mission.

Other suggestions to the RASSC were to consider general aviation needs and air freight and to hold an additional hearing at the recommendation stage of the study. No adverse environmental comments were received at this particular hearing.

Oakland - December 13, 1971

At this hearing, speakers included the Mayor of Oakland, a judge, and representatives from the California Public Utilities Commission, the President's Aviation Advisory Commission, California Department of Aeronautics, Port of Oakland, chambers of commerce/convention and tourism bureaus, citizens, industry groups, labor, League of Women Voters, conservation groups, an economic development agency, and a flower shipping company. There were approximately 100 attendees.

Many who testified advocated expansion of Oakland airport because such development would increase jobs, attract visitors, and improve service for Oakland.

Others felt that demand should not automatically be met, that growth should be restrained because of detrimental impact on environment, inflated population forecasts, and alternatives to growth, including increasing load factors, and improving ground transit and access.

The Chairman of the California Public Utilities Commission recommended that use of the existing airports to capacity be encouraged (particularly San Jose and Oakland) and dispersal of services near the origin/destination

of passengers. The Civil Aeronautics Board should then consider the Study findings for allocating routes. He offered Commission interest and support in the evolution of the plan.

Recommendations from those who testified included: keep military bases separate, explore the use of STOL, have flight operations over water to reduce noise, include general aviation in the study, look at a total transportation system, hold another hearing before final recommendation, and provide for airport planning and implementation of study findings after the study is completed. There was negative response to filling the Bay, and to three proposed sites - Richmond, Site E near Alviso, and Buchanan Field, Concord.

San Jose - January 10, 1972

Nearly 300 people attended, with representatives giving testimony from Congressman Edwards, local mayors, city managers, and councilmen, the Sierra Club, Save Our Valley Action Committee, chambers of commerce, League of Women Voters, a school district, airport committees, and industry, citizen, and conservation groups. Many individuals also spoke.

The opinion, reiterated almost unanimously, was opposition to Site E (Alviso-Fremont area), because of noise and air quality hazards, encroachment on the proposed National Wildlife Refuge Area and growth implications. Many speakers supported no further expansion of San Jose airport, while others recommended such expansion.

Several people again advised the Committee to integrate air travel with other modes of transportation; to revise population forecasts downward, to coordinate with the Metropolitan Transportation Commission; to hold another hearing after the recommendation was made; to consider a

regional airport away from urban areas, and to continue the study through an implementation phase.

There was great concern expressed over some implications of air travel/ airport development. It was felt that the needs of the air traveler should not take precedence over those of the rest of the population; that air travel demand was perhaps not as high a priority as other needs (e.g., housing); that there were serious medical effects due to noise and air pollution; and that citizens should exercise some control over the usage of airports. A question for the Committee to consider was who should control the number of flights — CAB, the airlines, the airport, or the passengers?

San Francisco — February 3, 1972

Speakers at this hearing represented the S.F. Airports Commission, Sierra Club, City of Alameda, League of Women Voters, S.F. Chamber of Commerce/Visitors and Convention Bureau, a community development corps, conservation groups, labor, Federal Aviation Administration, Air Transport Association, Bay Conservation and Development Commission, and San Francisco Planning and Urban Renewal Association. Approximately 200 people attended.

Opinion seemed to be divided between those speakers who favored expansion of all area airports (because of increased employment) to accommodate demand, and those who did not favor expansion, but instead higher load factors, fewer scheduled flights, revised forecasts, and dispersal of airports.

Recommendations were made to consider joint use of Hamilton, general aviation needs, long-term regional airport planning, distant new airport locations, converting military bases to recreation areas, coordination with MTC, and airports located near the origin and destination of passengers.

Again, the point was made to consider the majority of the public who do not fly.

Airport expansion involving Bay fill was opposed during testimony. The guideline stated by BCDC, the agency issuing permits for fill, is that if Bay fill is requested for airport expansion, the burden of proof is on the proponent.

San Rafael — February 18, 1972

Speakers were from San Benito, Marin, and Sonoma Counties, representing the Board of Supervisors of San Benito County, City of Hollister, Hollister Chamber of Commerce and Women's Club, City of Novato Planning Commission, Novato Neighborhood Planning Groups, two homeowners associations, Marin Alternative, and Sonoma County Airport.

Testimony from the Hollister area stated opposition to a regional airport in their community, because of the expansion it would bring to their rural area, severe air pollution potential, and earthquake hazards. Alternatives suggested were dispersal of services to small airports, and use of rapid transit.

Also considered was the joint civilian/military use of Hamilton Air Force Base. Most speakers opposed such use of Hamilton because it would seriously affect the noise and air pollution levels, property values, and rural nature of Marin County.

The Study Committee was requested to hold other public hearings prior to final adoption of a plan.

Many Marin citizens were concerned that impact of airports on their neighborhoods should be thoroughly evaluated before any recommendations

were made. An example of the community viewpoint was expressed by the representative of Marin Alternative: "Thank you, gentlemen for your professional views and studies. But in the final analysis it is we who want to determine the make-up of our communities and our regions."

APPENDIX C

Appendix C

QUESTIONNAIRE SURVEY RESULTS

To obtain the public's response to the development of airports in the area, the Association of Bay Area Governments (ABAG) distributed 30,000 copies of a newspaper, Aviation Future, containing a questionnaire in 1971 to:

Individuals	43%
Conservation/ecology groups	9%
League of Women Voters	9%
Chambers of Commerce	8%
Bay Area airports (13 airports)	13%
ABAG mailing lists	10%
Others	8%

Eight hundred and fifty-one people answered and returned the questionnaire contained in the newspaper, and also reprinted by Save Our Valley Action Committee, Novato Planning Committee, the Fremont Argus, and the Novato Advance. The questionnaire is shown on the following page. A summary of the responses is given in the following paragraphs.

It should be noted that the county of residence of the respondents did not provide a uniform sample of all communities in the Bay Area. A breakdown of the county of residence of respondents compared to population is as follows:

UNUSABLE

Wanted: Your Opinion

Your opinion can have influence even if you do not testify at the public hearings. Please help us reach the "best" recommendation for the Region by mailing us your completed questionnaire as soon as possible. Your written responses, in addition to answers to the following questions, are welcome.

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1. In your opinion, should the Bay Area provide additional facilities in the future for air travel into and out of the Region?
   305 Yes (35%)   275 No (22%)   244 I need to know more about the alternatives (29%) *

2. What relative importance do you assign to the following (please rank from 1, most important to 5, least important).
   ____ Air travel availability and quality
   ____ Easy access to and from airports
   ____ Financial benefits of airports   (see below)
   ____ Financial costs of airports
   ____ Environmental effects of aviation

3. Would you vote for an airport development:
   11 If the development were in your part of the Region?
   242 Yes (28%)   465 No (55%)   133 Undecided (16%)
   38 If the development were in some other part of the Region?
   236 Yes (28%)   288 No (34%)   289 Undecided (34%)

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4. As an airline passenger, how long a trip (in minutes) would be "reasonable" for you to travel to or from the airport?
   18 10 (2%)   129 20 (15%)   343 30 (40%)   170 40 (20%)   143 50 or more (17%)

5. If flight schedules were the *same* at these airports, which airport would you choose?

from home		*from work*	*from home*		*from work*
(17%) 147	San Francisco	130 (15%)	(38%) 319	San Jose	250 (29%)
(35%) 295	Oakland	273 (32%)	(2%) 16 (*where*)	other	21 (2%) (*where*)

73-home
178-work

15

6. If access time and cost were about the same for automobiles and rapid transit, which would you choose?
   143 automobile (17%)   652 rapid transit (77%)   41 undecided (5%)

7. In what city do you live? ~~(see below)~~
   In what city do you work? "

14

8. How many airline flights have you taken *out* of the Bay Area in the last year?
   190 0 (22%)   265 1-2 (31%)   165 3-4 (19%)   217 5 or more (26%)

9. Of the environmental issues listed below, how would you rank them in order of importance to you (from 1 most important to 6 least important)?   (see below)
   ____ air quality   ____ plant life
   ____ bay preservation   ____ population level
   ____ noise   ____ wild animal life

10. Please return to: Regional Airport Systems Study, Association of Bay Area Governments, Hotel Claremont, Berkeley, California 94705

* Corrected % are 37%, 33%, and 30%, respectively, of 824 usable replies.

County	Population (U.S. Census) 1970	Percent of Total Bay Area Population	Number of Responses to Questionnaire	Percent (by county) of Responses to Questionnaire
Alameda	1,073,000	23	213	25
Contra Costa	558,000	12	122	14
Marin	206,000	4	90	11
Napa	79,000	2	0	0
San Francisco	716,000	16	40	5
San Mateo	556,000	12	39	5
Santa Clara	1,065,000	23	323	38
Solano	170,000	4	8	1
Sonoma	205,000	4	8	1
TOTAL	4,628,000		851	

- Question 2 — What relative importance do you assign to the following (please rank from 1, most important to 5, least important).

	1	2	3	4	5	Unusable
Air travel availability and quality	191	216	174	129	89	52
Easy access to and from airports	119	214	215	152	100	51
Financial benefits of airports	22	63	168	201	333	64
Financial costs of airports	37	201	117	246	187	63
Environmental effects of aviation	486	97	113	48	74	33

- Question 5 — If flight schedules were the same at these airports, which airport would you choose?

Airport Preference from Home (No. of responses)	Airport	Airport Preference from Work (No. of responses)
295	Oakland	273
147	San Francisco	130
319	San Jose	250
5	Marin County	5
1	San Rafael	1
2	Contra Costa	1
1	Buchanan	1
2	Solano County	2
2	San Benito County	2
1	Mendocino County	-

Airport Preference from Home (No. of responses)	Airport	Airport Preference from Work (No. of responses)
1	Napa	1
1	Palo Alto	1
-	Fremont	1
-	Livermore	2
-	Walnut Creek	2
-	Hamilton	2
73	Unusable	178

- Question 9 — Of the environmental issues listed below, how would you rank them in order of importance to you (from 1, most important to 6, least important)?

	1	2	3	4	5	6	7	Unusable
Air quality	413	215	96	46	34	22	0	25
Bay preservation	105	172	195	187	92	68	2	30
Noise	163	182	164	97	89	136	0	20
Plant life	54	49	120	194	254	148	0	32
Population level	230	122	132	119	81	139	0	28
Wild animal life	56	64	85	139	219	254	0	34
Other	1	1	0	0	0	0	1	0

There are 157 additional comments, falling into the following categories: airport development (46), environment (43), access (22), other modes of transportation (10), questionnaire itself (8), RASS itself (6), improved airline service (5), personal relationship to aviation (7), and multiple comments (9).

COMMENTS AND COMPARISONS

- Questions 1 and 8 — providing additional facilities and number of flights in last year: Of the respondents who had flown one or more times out of the area, more favored additional facilities than did not. However, those who had not flown at all disapproved of additional facilities more often than they approved.
- Questions 3 and 8 — voting for nearby or distant airport development and number of flights: Most people responded that they did not favor either nearby or distant development, regardless of number of flights.

- Questions 4 and 6 — reasonable travel time and preference between automobile and rapid transit: The travel time chosen most often as reasonable by those who preferred either the automobile or rapid transit was 30 minutes.

  The travel times were ranked as follows:

  - Automobile: 30 minutes first, then 20, 40, 50, and 10 minutes
  - Rapid transit: 30 minutes first, then 40, 50, 20, and 10 minutes

- Questions 4 and 8 — reasonable travel time and frequency of flight: Whatever the frequency of flight, the preferred travel time was 30 minutes.

- Questions 1 and 3 — provide additional facilities and nearby/distant airport development: Of the responses possible, more responded "no" to providing facilities and "no" to voting for development — either nearby or distant.

  Desire for facilities and willingness to vote for airport development are correlated. The most frequent response was yes facilities/yes development.

- Questions 1 and 7a — providing facilities and county of residence: Of responses from Alameda, San Mateo, Santa Clara, and Sonoma Counties, more responded "no" to additional facilities than responded "yes." The reverse was true for Contra Costa, Marin, San Francisco, and Solano County respondents; more responded "yes" to additional facilities.

- Questions 5 and 8 — airport choices from home and work and number of flights (OAK=Oakland, SFO=San Francisco, SJC=San Jose).

  <u>From home</u>

  Those who have flown 3-4, or more than 5 times chose OAK, then SJC, then SFO. Those who have flown 0 or 1-2 times chose OAK, then SJC, then SFO.

  <u>From work</u>

  Those who have flown 0, 1-2, or 3-4 times chose OAK, then SJC, then SFO. Those who have flown more than 5 times chose SJC, then OAK, then SFO.

- Questions 5 and 7 — home and work airport choice, and county of residence and employment: Airport choices

from home and work when compared with county of residence and employment were so similar that they followed this pattern with only minor discrepancies;

County	Airport Choice (listed in order of ranking)
Alameda	OAK, SJC, SFO
Contra Costa	OAK, SFO, SJC
Marin	SFO, OAK
Napa	No response to questionnaire
San Francisco	SFO, OAK, SJC
San Mateo	SFO, SJC, OAK
Santa Clara	SJC, SFO, OAK
Solano	OAK, SFO
Sonoma	OAK, SFO

- Questions 6 and 8 — choice of automobile and rapid transit and frequency of flights: Of the people who chose rapid transit, the greatest number of responses came from those who had flown 1-2 times in the past year, while of those who chose automobiles, the greatest number of responses came from those who had flown more than 5 times. However, whatever the flight frequency, more people chose rapid transit than chose the automobile.

- Questions 7 and 8 — county of residence/employment and frequency of flight: The counties with a large sample — Alameda, Santa Clara, and Contra Costa — all followed this pattern of flight frequency; 1-2 flights/year most frequent, then more than 5, then 0, then 3-4 flights. (This applies to both county of residence and county of employment.)

- Compare the home and work airport choices stated in question 5 with the consultant work on Access done by Wilbur Smith, Phase I, June, 1970: (Airport Access).

  The Access report shows that for 1975, assuming unconstrained conditions, air passengers would be allocated as follows:

SFO	33%
OAK	44%
SJC	23%

The results of this questionnaire show that, of those who responded (note that there is a low response rate from Napa, San Francisco, San Mateo, Solano, and Sonoma Counties), and with unrestrained conditions, their choice of airports in 1972 would be as follows:

From Home		From Work	
SFO	17%	SFO	15%
OAK	35%	OAK	32%
SJC	38%	SJC	29%

APPENDIX D

Appendix D[1]

NOISE

Since the introduction of high-power military jet aircraft in the early 1950's and the widespread introduction of commercial jet aircraft in the early 1960's, considerable study has been devoted to the measurement of aircraft noise and the interpretation of aircraft noise with respect to its effect on people, both as individuals and as groups living in communities near airports. From these studies, various measures have evolved for relating the noise of single events, such as an aircraft flyover, to individual response, and various methods have been developed for estimating community response to the noise environment created by aircraft operations occurring over an extended period of time. Two types of noise descriptors are used in describing aircraft noise:

- Descriptors concerned with measurements of single events such as the noise generated by an aircraft takeoff, landing, or a ground runup operation. These are of practical interest in comparing one event with another, or in comparing the noise produced by different aircraft.
- Descriptors concerned with summarizing the noise exposure resulting from many individual noise events of different levels and time patterns occurring over a considerable time period. These are of particular interest in comparing the noise exposure existing at different positions around the airport, or in comparing the effect of changes in airport configurations or operations.

[1] Most of this section is excerpted from Aviation Noise Evaluations and Projections, San Francisco Bay Region, Bolt Beranek and Newman, August 1971

Of major concern at San Francisco International Airport is the noise produced by jet aircraft during takeoff and landing operations.

As shown in Figure D-1, a typical flyover noise signal can be characterized in time as a "haystack" shaped signal that emerges from a lower ambient noise level and increases to a maximum over a period of seconds and then decreases to merge once more with the background noise. The flyover signal can be described in terms of either the maximum noise level reached during the flyover or in terms of the integration of the noise signal over time (i. e., include the effects of signal duration as well as maximum level).

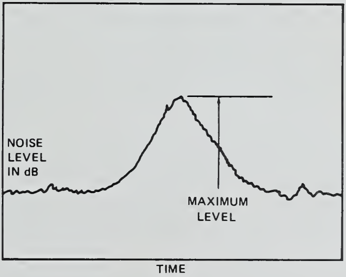

Figure D-1. Aircraft Noise Level Versus Time

Studies over the last few years have resulted in the development of several meaningful scales, of varying complexities and accuracy, for measuring aircraft noise. These studies were prompted by the fact that many direct and simple measurements of aircraft noise showed relatively poor correlation with people's subjective assessments of aircraft sounds. As an example, if one measures aircraft noise in terms of the overall sound pressure level using a sound level meter, one will find the same overall sound pressure level reading for a flyover by a jet aircraft and a piston-powered propeller aircraft. However, the jet aircraft would sound much noisier (or less acceptable) to the average observer than the flyover sound of a piston-powered propeller aircraft. The major reason for this discrepancy between measurement and human response is that the human ear does not respond equally well to sound of all frequencies but is less efficient at low and high frequencies than at medium or speech-range frequencies. Thus, to obtain a single number measure of the sound pressure level of a noise that may contain a wide range of frequencies in a manner approximating that of the ear, it is necessary to reduce, or weight, the low and high frequencies with respect to the medium frequencies.

Various noise exposure methods have been developed to describe the noise exposure resulting from repeated single events. All the procedures include some common elements that are vital in describing the noise impact in land areas surrounding an airport. These elements are:

- Evaluations of the noise level of individual events that are well correlated with people's response in terms of loudness, noisiness, or acceptability, or that can be related to speech interference effects.
- Adjustments for the relative duration of noise intrusions and the number of noise events occurring within a given time period.

- Weighting factors for daytime and nighttime (or daytime, evening, and night periods). Such weighting factors are particularly important in relating noise exposure to response in residential areas because of the increased sensitivity of people to noise intrusions during leisure and sleeping hours.

The effect of the adjustments and weighting factors is to expand the size of a given noise exposure contour as the noise levels increase, or as the number of operations increase, or as the proportion of night operations increase.

Currently three measures for describing the noise environment in the vicinity of airports are in use within the State of California. Listed in order of historical development, the three measures are:

- Composite Noise Rating (CNR)
- Noise Exposure Forecast (NEF)
- Community Noise Equivalent Level (CNEL)

The Noise Exposure Forecast procedures used in this report are a refinement of the earlier CNR procedures[2] widely used in this country by the FAA and Department of Defense for airport and land-use planning. The NEF procedures have been applied to define the noise exposure around a number of U.S. airports[3].

The CNEL is employed in the airport noise standards by the State of California and has been developed basically for noise surveillance to define noise impact areas around airports and to determine compliance with noise limits[4]. Table D-1 presents a summary comparison of the factors utilized in the three noise environment measures. The Bishop-Simpson report[3] gives further comparisons of NEF, CNR, and CNEL values to facilitate conversions from one measure to another.

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[2] Galloway, W. J., and Pietrasanta, A. C., Land Use Planning Relating to Aircraft Noise, Technical Report No. 821, Bolt Beranek and Newman Inc., published by the FAA, October 1964. Also published by the Department of Defense as AFM 86-5, TM 5-365, NAVDOCKS P-98, Land Use Planning with Respect to Aircraft Noise.

[3] Bishop, D. E., and Simpson, M. A., Noise Exposure Forecast Contours for 1967, 1970, and 1975 Operations at Selected Airports, FAA Report FAA-NO-70-8, 1970

[4] Section 21669 Public Utilities Code, State of California

Table D-1

COMPARISON OF FACTORS CONSIDERED
IN NOISE ENVIRONMENT MEASURES

Noise Environment Measure	Basic Noise Measure	Adjustment For Number Of Operations	Weighting For Time Of Day
CNR	PNL [b]	10 log n (modified) [a]	Night Weighting
NEF	EPNL [c]	10 log n	Night Weighting
CNEL	SENEL [d]	10 log n	Evening And Night Weightings

[a] Employs adjustments in 5-unit steps.

[b] Perceived noise level.

[c] Effective perceived noise level.

[d] Single event noise exposure level.

In July 1973 Wyle Laboratories completed the development of noise contours at San Francisco International Airport as they exist in 1972 and a prediction of them for the 1985-86 time period. Contour maps are shown as Figues 3-1 and 3-2 in the Environmental Impact Report.

The following paragraphs summarize Wyle Laboratories assumptions in this work:

INTRODUCTION

A realistic prediction of airport community noise requires a close simulation of actual airplane characteristics and flight procedures at the airport. Close attention to such details has been made for prediction of CNEL contours at San Francisco International Airport.

NOISE DATA

SENEL noise characteristics for each aircraft type were computed from data documented under an FAA contract.[1] In several instances, however, these data were altered to reflect published results of more recent tests.[2], [3] Manufacturer published data[3] were used to define the noise characteristics of airplanes quieted to meet the requirements of FAR 36. The assumption was made that, while there would be no retrofit of airplanes in the existing fleet, acoustic nacelle lining would be required on all aircraft not complying with FAR 36 Appendix C levels and sold after mid-1973.

AERODYNAMIC PERFORMANCE DATA

Aerodynamic performance parameters were computed by Wyle personnel based in part on manufacturer supplied data. Take-off profiles for each aircraft model over a range of weights were calculated assuming a sea level, 59°F day. Wind speed was zero unless otherwise noted.

Approach thrusts and speeds were computed for each aircraft type at a typical landing weight. Flap settings were chosen on the basis of discussions with airline operations officials.

OPERATIONAL ASSUMPTIONS

ATA standard procedure was used for all departures. This procedure consists of takeoff at maximum power, $V_2 + 10$ and a constant flap setting until reaching 1500 feet above ground level. At this point, power is reduced to maximum climb power or that thrust needed to maintain a 1000 fpm rate of climb, whichever is greater. At 3000 feet, the airplane pitches over and accelerates at a rate of 1 kt/sec. Flaps are retracted as speed permits. At a speed of 250 kts, climb is resumed in a clean configuration. Figure D-2 shows this profile schematically.

The "shoreline turn" off runway 28 was used by 80 percent of the pilots who were able and heading to the North or East.

Over each individual approach track, it has been assumed that all aircraft, regardless of type, follow the same path, i.e., all aircraft fly at the same pattern altitudes and make altitude transitions at the same places. Figure D-3 diagrams a typical approach procedure. The profile begins in the handoff area with aircraft at 200 knots and a maneuver flap setting. Transitions between a manimum of three pattern altitudes are made at a 500 foot/n.mi. gradient. On reaching final pattern altitude or on receipt of clearance to land, flaps are changed to an approach setting. Gear are extended at glide slope intercept. All final approaches (including VFR) are made along a 3^{o} glide slope. In accordance with ATA procedures, transitions from approach to landing flap settings are made at an altitude of 1000 feet. A landing speed of $1.3V_s$ + 10 knots is assumed while aircraft are on the glide slope. After touchdown, thrust is increased to approximately 75 percent maximum to stimulate thrust reversal.

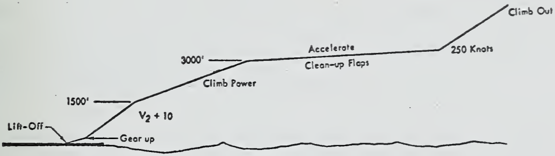


Figure D-2 Typical Takeoff Profile

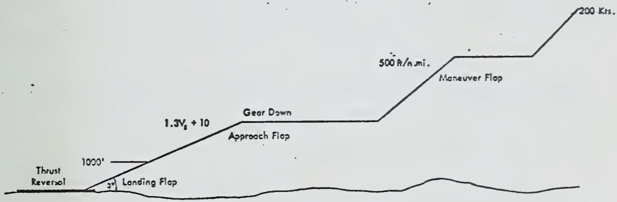


Figure D-3 Typical Approach Profile

FLEET MIX

The description of airport traffic was provided by R. Dixon Speas & Associates. Included in this traffic description were: arrival and departure frequencies for each of the aircraft types, day/evening/night traffic distribution, runway utilization, flight track assignments and departure stage lengths. In addition, definitions of the flight track geometry and approach patterns were provided.

The principal source of traffic distribution data was the Official Airline Guide. Only scheduled air carrier and cargo operations were considered. Stage lengths and from them, gross weights, were calculated based on city pair statistics. Discussions with FAA ATC personnel provided the basis for flight track and pattern defintions. Assumed runway usage was based on analysis of five years of weather records.

The number of annual operations was constrained to 310,000 operations/year at the direction of SFIA.

REFERENCES

1. Bishop, Dwight E., and Simpson, Miles A., "Noise Exposure Forecast Contours for 1967, 1970 and 1975 Operations at Selected Airports," FAA-NO-70-8, BB & N, September 1970.

2. Migdon and Segal, "Aircraft Noise: The Retrofitting Approach," Congressional Research Service, HE 9901, 72-78SP, March 1972.

3. Blumenthal, Russell and Streckenback, "Summary-Noise Reduction Research & Development," The Boeing Company D6-60146, January 1972.

4. "Airport Noise Reduction Forecast Program," DOT-OS-20088, in progress.

APPENDIX E

Appendix E

AIR QUALITY

In February 1971, the Bay Area Pollution Control District produced a report, Aviation Effect on Air Quality. This report described the existing air quality in the Bay Area in 1970 and the expected air quality in 1975, 1980, and 1985. It calculated the amount of emissions expected from aircraft at each airport in the future years, as well as emissions expected from other sources. The following paragraphs are a synopsis of that report.

Total emissions of air contaminants to the atmosphere from all sources in the nine-county San Francisco Bay Area are expected to decline substantially over the next 15 years, but the portion attributable to aviation activity at all airports will increase. Total nine-county emissions for 1970 are estimated to be 9,463 tons per day. This will decline to 3,600 by 1985, with the aviation portion increasing from 138 tons per day to 200[1] for all airports in the Bay Area. Emissions from aircraft are estimated on the basis of operations within the airshed below an altitude of 3,500 ft. The emissions at San Francisco International Airport are expected to decline slightly between 1970 and 1985.

Total emissions are as estimated by the Bay Area Air Pollution Control District and include factors that are not detailed in this statement. Among the basic assumptions that underlie these calculations are that new motor vehicles will meet federal and state emission requirements for each model year from 1971 to 1976, that no more stringent controls will be mandated for models later than 1976, that the retirement/replacement ratio of auto-

[1] Gillfillan, op. cit.

mobiles will remain constant, that the regulations of the District will be fully effectuated within the nine-county Bay Area, and that area-wide growth will continue.

Aircraft emission rates per operation by type of aircraft are shown in Tables E-1 and E-2.

The newer jet aircraft such as the DC-10 and 747 have generally "cleaner" engines than the 707 or DC-8. This comparison is shown on Table E-1. The "cleaner" generally means a lowering of particulates. The total amount of pollutants for the new engines is comparable to the 707 or DC-8 engines, but there are some differences in particular emission levels. The tables show that particulates are lower for the 747 and DC-10 than for the 707 or DC-8. For carbon monoxide (CO), the DC-10 is much higher and the 747 is almost half way between the figures for various DC-8 or 707 engine types. For nitrous oxides (NO_x), the DC-10 is much higher and the 747 is slightly higher than the DC-8 or 707. For the organics, the DC-10 and 747 are considerably lower and for sulfur dioxide, they are about comparable to the 707 and DC-8. The Bay Area Air Pollution Control District used all of these figures in their calculations and evaluation of future air quality in the Bay Area.

Table E-1

COMMERCIAL AIR CARRIER EMISSION FACTORS

Aircraft and Engine	Fuel per Engine per Operation (gal)	No. of Engines	Total Fuel per Operation (gal)	Contaminant Emissions per Aircraft (lb/operation)					
				Part	CO	NO_x	Org.	SO_x	Total
Convair 880									
CJ805	64	4	256	19.5	33.0	10.0	36.4	4.0	[illegible]
Rotorcraft	10	2	20	1.5	2.6	0.8	2.8	0.3	8
B-720									
JT3C	89	4	356	23.1	39.9	9.6	9.3	5.6	88
JT3D	89	4	356	22.4	84.7	11.7	50.6	5.6	175
B-737-200, DC-9									
JT8D Old	66	2	132	10.7	19.0	4.2	7.5	[illegible]	44
New	66	2	132	7.9	16.2	6.3	4.0	[illegible]	37
B-727-100, B-727-200									
JT8D Old	66	3	198	16.0	28.5	6.3	[illegible]	[illegible]	[illegible]
New	66	3	198	11.9	24.4	9.5	5.9	[illegible]	[illegible]
B-707, DC-8, DC-8-60									
JT4	89	4	356	24.9	65.5	7.5	27.8	5.6	[illegible]
JT3D	89	4	356	22.4	84.7	11.7	50.6	[illegible]	[illegible]
DC-10, L-1011									
CF6 or RB. 211	111	3	333	11.0	42.6	65.6	11.0	5.2	[illegible]
B-747									
JT-9D	95	4	380	12.5	71.1	13.3	12.9	5.9	[illegible]

Table E-2

GENERAL AVIATION EMISSION FACTORS AND FUEL USAGE

Engine	Part.	Emission Factors (lb/100 gal fuel)			
		CO	NO_x	ORG.	SO_x
Jet	7.6	12.9	1.9	4.3	1.56
Turboprop	10.4	5.4	5.6	3.9	1.56
Gasoline	1.2	245.0	14.7	49.6	-

Aircraft	Fuel Usage (gal/operation)	Emission Factors (lb/operation)				
		Part.	CO	NO_x	Org	SO_x
Gasoline						
Single engine						
1-3 place	1.0	0.012	2.45	0.147	0.496	-
4+ place	1.5	0.018	3.67	0.221	0.744	-
Multiengine						
Under 600 hp	3	0.036	7.35	0.441	1.488	-
Over 600 hp	8	0.096	19.6	1.176	3.968	-
Rotocraft	1	0.012	2.45	0.147	0.496	-
Turbine Fuel						
Turboprop[a]	25	2.6	1.35	1.4	0.975	0.39
Turbojet	64	4.86	8.26	1.22	2.75	1.00
Third-level air carrier[a]	25	2.6	1.35	1.4	0.975	0.39

[a] Third level air carriers counted with general aviation.

These emission rates were obtained from a variety of sources and in certain instances data were conflicting, so the information was selected, averaged, or thrown out, depending on judgmental decisions by Bay Area Pollution Control District personnel. The emission rates were then multiplied by the number of aircraft operations in each category in 1970 and 1985 to obtain the number of tons of pollutants per day emitted.

The report Aviation Effect on Air Quality estimated 442,900 annual airline operations in 1985 at San Francisco International Airport. The Regional Airport Systems Study Final Plan Recommendation stated that San Francisco International Airport has a recommended airline operation capacity of 310,000 annual movements in 1985. To estimate the pollutant emissions in 1985 for this lower figure, each type of aircraft operation for 1985 was reduced by a factor of 3,100, divided by 4,429, and then totaled. Helicopter operations and general aviation operations were taken to be the same as in the report on Aviation Effect on Air Quality.

The results are given in Tables E-3 and E-4, which show the estimated pollutants produced by vehicles and aircraft on San Francisco International Airport in 1970 and 1985. In addition, vehicles going to and from the airport are expected to produce 38 tons per day of pollutants in 1985. This figure was calculated using the 80-tons-per-day figure quoted in the RASS Final Plan Recommendation for all airline airports for the Bay Area and proportioning the 80 tons among the airports based on the estimate of annual passengers who are expected to use automobiles.

Table E-3

AIR CONTAMINANT EMISSIONS
AT
SAN FRANCISCO INTERNATIONAL AIRPORT — 1970
(tons per day)

	Part.	Co	No	Org	SO_x	Total
Aircraft emissions						
Air carrier	8.1	22.3	3.6	11.7	1.8	47.5
Jet fuel dumping	—	—	—	1.8	—	1.8
General aviation	0.1	0.1	0.1	0.1	—	0.4
Subtotal	8.2	22.4	3.7	13.6	1.8	49.7
Ground emissions (nonaircraft)						
Motor vehicles	0.1	8.5	0.6	1.6	—	10.8
Fuel handling	—	—	—	0.1	—	0.1
Engine test cell	0.4	1.1	0.2	0.6	0.1	2.4
Subtotal	0.5	9.6	0.8	2.3	0.1	13.3
Total emissions	8.7	32.0	4.5	15.9	1.9	63.0

Table E-4

AIR CONTAMINANT EMISSIONS
AT
SAN FRANCISCO INTERNATIONAL AIRPORT — 1985
(tons per day)

	Part.	Co	No	Org	SO_x	Total
Aircraft emissions						
Air carrier	5.9	20.3	12.7	6.4	2.0	47.3
General aviation	0.2	0.2	0.1	0.1	—	0.6
Subtotal	6.1	20.5	12.8	6.5	2.0	47.9
Ground emissions (nonaircraft)						
Motor vehicles	0.1	1.2	0.2	0.1	0.1	1.7
Fuel handling	—	—	—	—	—	0.2
Engine test cell	0.4	1.2	0.6	0.5	0.1	2.8
Subtotal	0.5	2.4	0.8	0.8	0.2	4.7
Total emissions	6.6	22.9	13.6	7.3	2.2	52.6

The total air emissions are summarized in Table E-5, which indicates that the SFO-related air contaminant emissions for 1985 will decrease over 1970 levels.

Table E-5

TOTAL NINE-COUNTY AIR EMISSIONS
(tons per day)

	Nine-County 1970	SFO 1970 Portion	Nine-County 1985	SFO 1985 Portion
Total nine-county (all sources)	9,463	246	3,600	90.6
Aircraft	121	49.7	200	47.9
Other airport	17	13.3	10	4.7
Autos to airports	NA	183.0	80	38.0

The number of automobiles to and from the airport will increase in 1985 as compared with 1970. The emissions from automobiles traveling to or from the airport will go down from an estimated 183 tons per day in 1970 to 38 tons in 1985. This marked reduction is due to more stringent auto pollution devices required of car manufacturers. The 1970 figure was calculated as follows:

Emission	1970 — Grams/Mile
CO (Urban)	95.0
HC (Urban)	14.7
NO_x	6.63
Particulates	0.3
SO_2	0.11

Source: E. P. A., Compilation of Air Pollutant Emission Factors, February, 1972

The emissions are for the average car in 1970. The average passenger's one-way auto trip is 21 miles to the airport and the average employee's one-way auto trip is 14 miles. In 1970 there were an estimated 50,000 average daily passenger auto trips to and from the airport and 27,000 average daily employee auto trips to and from the airport.

Pollutant levels caused by airport operations at specific community locations are also of concern. Aircraft ground operations and ground vehicle operations have the greatest potential for adverse effects upon adjacent communities. The Bay Area Pollution Control District developed a "hybrid diffusion model" as applied to the operations at San Francisco International Airport to assess quantitatively the community impact. This is a mathematical model calculated by a computer, and is explained in detail together with the relevant assumptions in Aviation Effect on Air Quality Regional Airport Systems Study, February 1971. The results of the model are described in the following paragraphs.

At San Francisco International Airport, the present demand levels already show an appreciable impact on air quality (see Table E-6). At receptor sites 2 and 4 near the ends of the major runway complexes (see Figure E-1), high levels might be expected. Nevertheless, the calculated levels

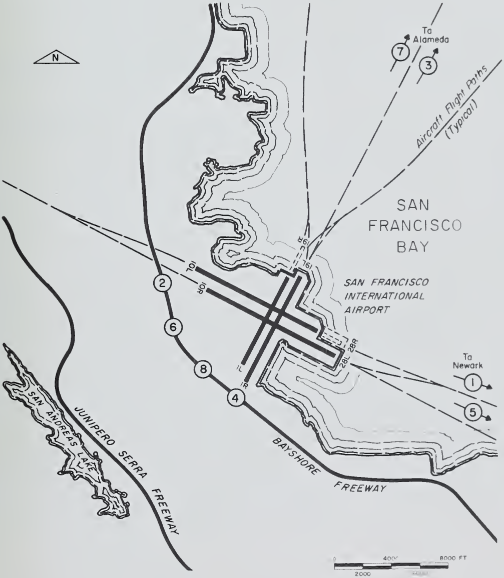


Figure E-1. Location of Receptors

Table E-6

CALCULATED AIR QUALITY IMPACT FROM AIRCRAFT GROUND OPERATIONS AND ASSOCIATED AUTOMOTIVE TRAFFIC UNDER PRESENT (1970) DEMAND LEVELS AT INDICATED DOWNWIND RECEPTOR SITES

	Receptor Site							
	SFO-AGO				SFO-AAT			
Contaminant	1	2	3	4	5	6	7	8
Particulates ($\mu g/m^3$:24-hr avg)								
C	1	312	3	490	1	28	T	28
E	21	698	34	1070	4	46	1	46
Carbon monoxide (ppm)								
C	T	3.0	T	4.7	T	2.0	T	2.0
E	0.6	14.0	0.9	21.2	0.6	5.6	0.2	5.6
Nitrogen oxides (ppm)								
C	T	0.24	T	0.38	T	0.14	T	0.14
E	0.05	1.12	0.08	1.70	0.04	0.39	0.01	0.39
Organics (ppm, as butane)								
C	T	0.70	0.01	1.09	T	0.20	T	0.20
E	0.14	3.25	0.23	4.92	0.06	0.56	0.02	0.56
Sulfur oxides (ppb)								
C	1.3	54.0	5.6	84.6	—	—	—	—
E	10.4	252.0	16.4	382.0	—	—	—	—

Note: AGO — Aircraft Ground Operations
AAT — Associated Automotive Traffic
T — Trace
C — Typical Unstable Meteorological Conditions
E — Adverse Stable Meteorological Conditions

are surprisingly high for particulates and for sulfur oxides. Particulate levels under C conditions (typical unstable) at site 4 are 490 micrograms per cubic meter, which is almost five times the California State standard of 100 micrograms per cubic meter for 24-hour particulates. These levels must be considered in addition to a background from all other upwind Bay Area sources, which already show levels in excess of 60 micrograms per cubic meter at Bay Area Air Pollution Control District monitoring stations.

One ameliorative factor is operative in air traffic control procedures at San Francisco International Airport. Under light-wind conditions, the 28L-28R runway complex is used for landings, and the perpendicular 1L-1R runway complex is used for takeoffs. Thus, under conditions most likely to be adverse, the concentrations at sites 2 and 4 are substantially reduced (by a factor approaching two).

At receptor site 4 (in Burlingame), actual particulate levels have been monitored by the Bay Area Air Pollution Control District in 1970. Values as high as 240 micrograms per cubic meter have been measured (under C stability conditions with an elevated marine inversion), thus confirming very well the calculations and the model, as adjusted to airport operating practices.

The other contaminants can be evaluated in terms of hourly rather than 24-hour averages, and none of them exceeds State standards. However, the SO_2 level of 84.6 ppb would, if sustained for 12 hours, give a 24-hour average in excess of the State standard of 40 ppb. The CO level of 4.7 ppm could, when added to freeway levels, cause State standards to be exceeded (as has been observed at Burlingame). The organics level of 1.09 ppm is not serious in terms of photochemical oxidant formation at

the site, but reactive components of the exhaust may add to oxidant formation downwind. In addition, the level is high enough to create odor problems at sites 2 and 4.

Receptor site 1, 27 kilometers downwind, is of interest since it lies in the Newark-Fremont area with frequently measured high contaminant values. At this distance, the impact of San Francisco International Airport is not calculated to be significant, except for particulates under E conditions. Since E conditions could be sustained over smooth water at night, the particulate contribution of 21 micrograms per cubic meter cannot be completely disregarded.

The future projections for San Francisco Airport (see Tables E-7 and E-8) do not show any major differences from present conditions. There is slight improvement with increasing controls at the 450,000 annual aircraft operations level, followed by return to present values at a level of 588,000 annual aircraft operations. These levels are far in excess of the 370,000 annual operations now expected to be the total airport capacity. The 370,000 total runway operations includes 310,000 airline operations and 60,000 other aviation-type operations. The annual airport capacity has been reduced because of turbulence caused by large aircraft, resulting in a greater separation between aircraft than occurred in 1970. This means that the expected pollution levels will be less than shown in the Tables E-7 and E-8.

In the Bay Area, an inversion layer occurs a large percent of the time between 2500 and 3000 feet, which keeps pollutants below the inversion. Pollutants above the inversion layer mix and disperse in the atmosphere. No definitive studies have yet been made of air pollution caused by aircraft above 3500 feet and below the upper atmosphere. The Mitre Corporation of Virginia has a study in progress which may provide data on this subject.

Table E-7

CALCULATED AIR QUALITY IMPACT FOR AIRCRAFT GROUND OPERATIONS AND ASSOCIATED AUTOMOTIVE TRAFFIC FOR 450,000 TOTAL ANNUAL AIRCRAFT OPERATIONS AT DOWNWIND RECEPTOR SITES

Contaminant	Receptor Site							
	SFO-AGO				SO-AAT			
	1	2	3	4	5	6	7	8
Particulates ($\mu g/m^3$:24-hr avg)								
C	1	290	3	456	1	28	T	28
E	20	650	32	990	4	46	1	46
Carbon monoxide (ppm)								
C	T	3.5	T	5.5	T	0.6	T	0.6
E	0.7	16.4	1.1	24.8	0.2	1.6	0.1	1.6
Nitrogen oxides (ppm)								
C	0.02	0.69	0.07	1.10	T	0.12	T	0.12
E	0.14	3.22	0.23	4.90	0.03	0.32	T	0.32
Organics (ppm, as butane)								
C	T	0.70	0.01	1.09	T	0.04	T	0.04
E	0.14	3.25	0.23	4.92	0.01	0.11	T	0.11
Sulfur oxides (ppb)								
C	1.6	67.6	70.0	106.0	—	—	—	—
E	13.4	315.0	20.5	477.0	—	—	—	—

Note: AGO — Aircraft Ground Operations
AAT — Associated Automotive Traffic
T — Trace
C — Typical Unstable Meteorological Conditions
E — Adverse Stable Meteorological Conditions

Table E-8

CALCULATED AIR QUALITY IMPACT FOR
AIRCRAFT GROUND OPERATIONS AND
ASSOCIATED AUTOMOTIVE TRAFFIC FOR
588,000 TOTAL ANNUAL AIRCRAFT OPERATIONS
AT DOWNWIND RECEPTOR SITES

Contaminant	Receptor Site							
	SFO-AGO				SOF-AAT			
	1	2	3	4	5	6	7	8
Particulates ($\mu g/m^3$:24-hr avg)								
C	1	312	3	490	2	56	T	56
E	21	698	34	1070	8	92	2	92
Carbon monoxide (ppm)								
C	T	4.4	0.1	6.9	T	0.2	T	0.2
E	0.8	20.6	1.4	31.2	0.1	0.5	T	0.5
Nitrogen oxides (ppm)								
C	T	1.28	0.01	2.02	T	0.05	T	0.05
E	0.27	5.96	0.43	9.05	0.01	0.13	T	0.13
Organics (ppm, as butane)								
C	T	0.65	T	1.01	T	0.01	T	0.01
E	0.13	3.02	0.21	4.57	T	0.03	T	0.03
Sulfur oxides (ppb)								
C	1.6	67.5	7.0	106.0	0.4	11.8	0.1	11.8
E	13.0	315.0	20.5	478.0	4.6	32.4	1.2	32.4

Note: AGO — Aircraft Ground Operations
AAT — Associated Automotive Traffic
T — Trace
C — Typical Unstable Meteorological Conditions
E — Adverse Stable Meteorological Conditions

For comparison purposes, data, which show the air quality in six Bay Area counties in 1970, were extracted from the report Aviation Effect on Air Quality. Table E-9 shows these data for the area with the situation in the vicinity of San Francisco Airport.

Table E-9

QIR QUALITY DATA - BAY AREA*, 1970

Substance	Present State Standard	Number of Times Standard was Exceeded
Oxidant	0.1 ppm for 1 hour	106 days* 16 days **
Carbon Monoxide	10 ppm for 12 hours	5 days* 1 day** Highest 12-hour Average: 11.8 ppm
Sulfur Dioxide	0.04 ppm average for 24 hours	18 days* 0 day**
	0.5 ppm for 1 hour	Approximately 16 days of concentration above 0.5 ppm for 60-minute periods or longer. (1969 data)
Particulate	60 $\mu g/m^3$ annual geometric mean	Range: 51 $\mu g/m^3$-73 $\mu g/m^3$*
	No single 24-hour sample to exceed 100 $\mu g/m^3$	Approximately 15% of 24-hour samples were greater than 100 $\mu g/m^3$. Approximately 8%.**
Visibility-Reducing Particles	Visibility of not less than 10 miles when relative humidity is less than 70%	130 days in San Francisco (Airport) 113 days in San Jose (Airport) 163 days in Moffett Field
Nitrogen Dioxide	0.25 ppm for 1 hour	9 days* 1 day***

*Data are for January-November, 1970, six counties only: Alameda, Contra Costa, Marin, San Francisco, San Mateo and Santa Clara.
**Data for Burlingame Station (nearest to San Francisco Airport).
***Redwood City Station. Data for Burlingame incomplete.

Source "Aviation Effects on Air Quality" - Regional Airport System Study, February 1971.

APPENDIX F

Appendix F

EMPLOYMENT IMPACT

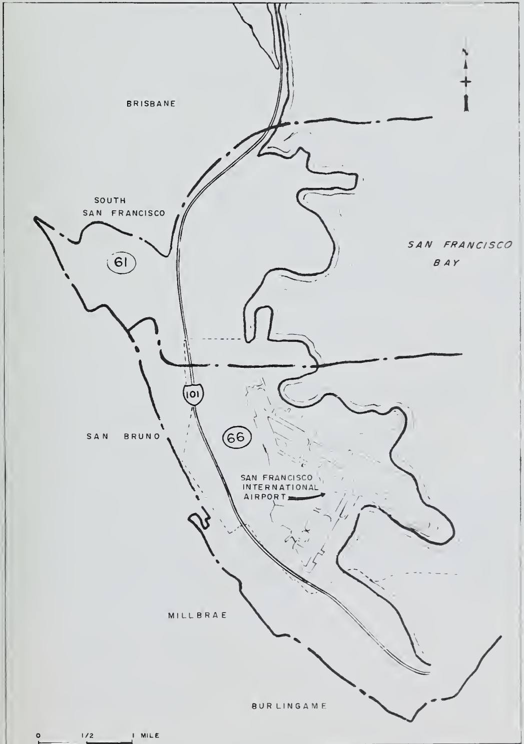
The proposed expansion, together with more passengers, will increase the number of employees working on or immediately adjacent to the airport. The following reports have described the expected employment changes:

- Wilsey and Ham, The Effect of Aviation on Physical Environment and Land-Uses, 1971
- William Goldner, et al., Economic and Spatial Impacts of Alternative Sizes and Locations in the San Francisco Bay Region, July 1971, Volumes 1 and 2

These reports documented employment areas on and adjacent to the airport. These areas were labelled by the Bay Area Transportation Study Commission (BATSC) as zones 61 and 66. Zone 61 corresponds to census tract 003 and zone 66 includes census tracts 024, 029, and 033 all in San Mateo County, as shown in Figure F-1.

Table F-1 lists the expected changes in "basic employment" between 1965 when the airport had 8.7 million total annual passengers and 1985 with 31.0 million annual passengers. The "basic industries" were determined in the previously cited reports and are defined later in this report.

Table F-1 shows that of the 24,139 total basic employee increase, 13,655 in the Air Transportation, Hotel, and Federal Government categories are due only to air passenger growth.



SAN FRANCISCO INTERNATIONAL AIRPORT
ENVIRONMENTAL IMPACT REPORT
AIRPORT LOCATION
WITHIN BAY AREA TRANSPORTATION STUDY COMMISSION ZONES 61 & 66
FIGURE F-1

Table F-1

FUTURE BASIC EMPLOYMENT CHANGES –
SAN FRANCISCO INTERNATIONAL AIRPORT

	Zone 61			Zone 66			Total Zones 61/66		
	1965	Change	1985	1965	Change	1985	1965	Change	1985
Basic Employment (number of employees)									
Air transportation	0	0	0	14,140	12,061	26,201	14,140	12,061	26,201
Hotels	110	1,214	1,324	347	0	347	457	1,214	1,671
Federal government	36	390	426	897	0	897	933	390	1,323
Wholesale trade	3,786	3,156	6,942	2,525	0	2,525	6,311	3,156	9,467
Other basic	8,307	3,755	12,062	4,158	3,563	7,721	12,465	7,318	19,783
	12,239	8,515	20,754	22,067	15,624	37,691	34,306	24,139	58,445

Note: Annual passengers enplaned and deplaned at SFO in 1985 = 31,000,000

Each "basic industry" that has shown significant economic relationships with the air transportation industry was evaluated on the basis of the following criteria:

- o The dollar volume of transactions interchanged with the air transportation industry
- o The relative concentration of the industry around San Francisco International Airport in 1965 based on BATSC survey results[1]
- o The logical association of the industry with the near-airport location requirement

From this analysis, four "basic industry" cat egories were selected as being significantly influenced by the near-airport location feature. These industries, together with their two-digit Standard Industrial Classification (SIC) numbers as assigned by BATSC, are as follows:

Industry	SIC Number
Transportation by air	45
Hotels and other lodging places	70
Federal government	91
Wholesale trade	50

[1] Unpublished tabulations of employment by two-digit SIC number in each BATSC Map Zone from the 1965 BATSC survey.

The air transportation industry is by far the most important of the four, rating very high under all three criteria. The hotel industry is becoming increasingly important around major airports. The federal government is primarily the FAA. The wholesale trade industries locate near transportation facilities generally and only certain segments of wholesale trade are heavy users or suppliers for air transportation.

Some industries were not included in the above tabulation. The petroleum industry (SIC number 29) was omitted even though it is a relatively important supplier to the air transportation industry. Most of the "basic" part of the petroleum industry in the Bay Area is located in Contra Costa County where the large petroleum refineries have good harbor access for their tankers on the northeastern part of San Francisco Bay. There is very little employment in this industry located near the commercial airports of the region even though commercial aircraft are important petroleum consumers. Aircraft fueling is done primarily by airline employees, who are included in the air transportation employment category. There is no reason to expect that airport location or activity levels will significantly affect petroleum industry location in the future.

The transportation equipment industry (SIC number 37), which includes aircraft, aero engines, parts, etc., was also omitted. Prime manufacturers of commercial aircraft generally locate on or adjacent to airports (although not necessarily major commercial airports). Subcontractors will often locate around these prime industries. However, there are no prime commercial aircraft manufacturers located in the Bay Area and there is no good reason to expect a prime aircraft manufacturer to move into the region in the foreseeable future. It should be noted, however, that aerospace-oriented companies and other research and development firms are generally heavy users of air transportation and are often motivated to locate their facilities around major commercial airports.

These types of companies are represented in a large number of industry categories, however, which makes them difficult to identify from a two-digit SIC industry breakdown.

The state government is a significant user of air transportation, but this industry was also not included. State offices in the Bay Area are primarily located within the central business districts (primarily downtown San Francisco). Most state aviation regulatory groups and agencies are located in Sacramento. No change in these patterns in the future is expected.

It has been assumed that air transportation employment around airports is a direct function of the passenger traffic levels at those airports.

During the base year, 1965, there was only one major commercial airport in the Bay Area — San Francisco International. In 1965 there were 14,140 air transportation employees at or around the San Francisco Airport. Virtually all of these were located within BATSC Map Zone 66. Of this total about 6,000 were employed at United Air Lines' jet maintenance base located at the San Francisco Airport. The remaining 8,140 were directly associated with activity at the airport. With 8.7 million passengers enplaned and deplaned at San Francisco International in 1965, a ratio of 1,069 passengers per employee results:

$$\frac{8,700,000}{8,140} = 1,069$$

As with most highly mechanized industries, air transportation employees are becoming more productive over time. There is an average annual increase in passengers per employee of about 4.7 percent per year. It is assumed that this is a normal rate of employee productivity increase which will continue in the future. Thus, by 1985, for example, air transportation employees at San Francisco International Airport will service

about 2,672 annual airport passengers per employee, resulting in a total of 26,201 employees for 31 million annual passengers.

The same general method was used to project future employment levels at United's jet maintenance base. However, because this facility is used to service United's total system operations, the relationship was established between these employees and the total passengers on United's system. There is no direct relationship between the number of employees at the maintenance base and airline passengers at San Francisco Airport. In 1965 United enplaned and deplaned about 34.4 million passengers for their total system. This means that the 6,000 employees at their jet maintenance base in San Francisco served about 5,731 United passengers per employee. Again, assuming normal industry productivity increase, this figure would increase by about 4.7 percent per year. Thus, by 1985, United's maintenance base employees will be able to serve about 14,330 system airline passengers per employee. The size of the employment force depends on the size of United's aircraft fleet, employee efficiency, and the aircraft fleets' mechanical efficiency.

Hotel employment is generally a function of the number of hotel rooms available. A full-service hotel will employ about one person for every 3.5 rooms. This ratio has not and is not expected to change substantially. Hotel rooms around San Francisco International Airport exist at a rate of about 1,000 rooms for every 5 to 5.5 million enplaned and deplaned passengers. The assumption is that future hotel expansion will take place at a rate of about 1,000 rooms per 5.3 million passengers. This results in about 54 hotel employees per one million airline passengers, or 1,671 hotel employees when the air port reaches 31 million annual passengers.

Federal employees associated with the operations of a major commercial airport can be considered as a specialized group of air transportation employees. There were about 8.7 air transportation employees at San Francisco International Airport in 1965 for every federal employee in the

airport area. It is assumed that this ratio of one federal employee for every 8.7 air transportation employees will continue in the future, resulting in 1,323 federal employees.

It is difficult to establish meaningful relationships between the wholesale trade industry and airport traffic levels. Segments of this industry are important suppliers to air transportation and other segments are important air transportation users (particularly of air cargo service). Still other segments of the industry locate around airports because of the availability of other modes of transportation. As traffic grows around an airport, certain segments of the wholesale trade industry located there would expand. On the other hand, expansion of other types of industry around the major airports will create increasing land values and surface transportation congestion conditions, which will tend to deter the growth of some segments of the wholesale trade industry. For these reasons, it has been assumed that, as a group, the wholesale trade establishments now located around the major airport sites will grow at about the same rate as projected for this industry in the region as a whole.

The area around each major airport will contain categories of "basic employment" other than those associated with the four industries above. For example, in 1965 about 36 percent of the "basic employment" in Map Zones 61 and 66 around San Francisco International was in other "basic industries." No one industry other than the four discussed above appears singularly significant. However, it is reasonable to assume that as a general rule these employees represent companies that for various reasons find it advantageous to be located in the general vicinity of the airport. It has been assumed that employment in each of these "other basic industries" located in the area around a major airport will grow at the same rate as that projected for each specific industry in the region as a whole. The regional industry growth rates represented by these data

are applied to the base year employment levels of each industry located in a particular airport's area to calculate the "other basic industry" employment for that area during any future time period.

The figures in Table F-1 are slightly lower than shown in the previously cited reports. This is because employment figures were reduced in the air transportation, hotel, and federal employee categories to reflect 31 million annual passengers in 1985 instead of 32.65 million annual passengers used in the reports.

No set standard has been rigorously adhered to in determining the acreage required to accommodate "basic industry" growth around major airport sites in the future. Generally, basic industry land requirements range between 10 and 20 employees per acre in the Bay Area depending upon the specific industry involved and the general intensity of land usage in the specific area of the region being considered. For example, the amount of usable industrial acreage available in the area around San Francisco Airport is becoming relatively scarce so that future development in this area will warrant more intensive land usage than would be true in less urbanized areas of the region. It is assumed that all air transportation employees at a given airport will be employed on the airport property itself. Thus, at San Francisco Airport, where the land available for expansion is limited, future employment densities on the airport property (exclusive of land requirements for runways, taxiways, etc.) may run as high as 50 to 55 employees per acre in the future.

Hotels also represent a higher intensity land use than most "basic industries" being considered. It has been assumed that hotel acreage requirements will be about 90 rooms per acre in any of the major airport areas. Where land is available for development, it has been assumed that air transportation, federal government, and wholesale trade will develop at

an intensity of about 10 employees per acre. Other "basic industries" locating around the major airports will develop at a higher intensity of about 20 employees per acre. From these assumptions, all the usable vacant land existing in 1965 in zones 61 and 66 will be utilized by 1985.

APPENDIX G

Appendix G

WILDLIFE BREEDING, NESTING, FEEDING GROUNDS

The Regional Airport Systems Study, The Effect of Aviation on Physical Environment and Land Uses in the Bay Region prepared by Wilsey and Ham, describes the existing knowledge of the ecological relationships between species living in the Bay Region and environmental changes instigated by man. The physical characteristics of animal and vegetative species within the wildlife habitats adjacent to the airport are described. Due to limitations of resources and time, only a general identification of these complex and intricate habitats based on today's knowledge was made. Only through more detailed research and analysis of these habitats will man begin to understand their ecological relationships and his impact on them through modification of the environment.

Shallow Bay waters are on the east side of the airport. These waters, as they move by tidal action across the mud flats and into the marshes, serve as a transfer medium. They bring water and minerals to the salt marsh and remove food and oxygen as they leave. They supply the filter-feeding invertebrates in the mud with life-giving detritus. They move the fish, particularly in their young stages, into the rich mix along the edges of the Bay. And finally, they provide the medium in which some diving birds — e.g., grebes, mergansers, and loons — may find sustenance, or through which diving ducks — e.g., canvasbacks and scaup — may descend to their food in the muds below. Most of the organisms in the water are minute but play a major role in the intricate web of life.

The phytoplankton of the Bay is dominated by diatoms with some 27 genera being represented. A few single-celled green algae and dinoflagellates are also present in Bay waters. Diatoms may at times be so prevalent that about 10,000,000 are present in a quart of Bay water.[1] However, in spite of their large numbers, their open-water production of food for aquatic life compared to production in salt marshes is but a small fraction of the whole.

Protozoans in the Bay are mainly either ciliates or flagellates. These microscopic animals sometimes occur in concentrations of 20,000 per quart and may represent some six different genera.[1]

There are four major groups of zooplankton represented in Bay waters. They range from the microscopic plants and animals listed above to the larger forms, such as the fish, which will be discussed later. The four major groups are:

- Polychaeta larvae (segmented worms)
- Copepods (crustacean forms)
- Fish larvae
- Snail larvae

The copepods are by far the most abundant and widespread of these forms of life with as many as 75 per quart being taken per sample. They are barely visible to the naked eye because they are often less than one-eight of an inch long.

Shrimp constitute an important part of the Bay ecosystem because they forage for food both on the bottom and in the waters of the Bay. The

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[1] Storrs, P.N., Sellek, R.E., and Pearson, E.A., A Comprehensive Study of San Francisco Bay, 1963-64, S.E.R.L. Report 65-1; Berkeley, University of California, 1965

three shrimp types that are common or of great ecological importance are the Bay shrimp (Crago franciscorum), the blacktail shrimp (Crago nigricauda), and the opossum shrimp (Neomysis awatschansis). The Bay shrimp was once highly priced as human food, but with the present high level of pollution of the Bay it is not so used. The opossum shrimp is the major food of young striped bass, an important sport fish.

There are about 125 species of fish in the Bay.[2] San Francisco Bay plays a vital part in both commercial and sports fishing. It has been estimated that over $20 million dollars per year are spent on sports fishing alone. The State Department of Fish and Game has conducted surveys during recent years (1963-66) that indicate great numbers of certain species. Striped bass, for example, are thought to comprise a population of several million. The northern anchovy and shiner perch are probably even more numerous. Of some 70 species caught in the Department study of San Francisco Bay proper, the highest species diversity was near Treasure Island. The lowest diversity (average of 10 species) was found south of Dumbarton Bridge.[3] The following is a list of the 20 most common fish species south of the Richmond Bridge, listed by relative abundance:

Northern anchovy (most numerous fish in the Bay)
Shiner perch
English sole
Pacific herring
Bay goby
Speckled sandab
Jacksmelt
White croaker
Pacific staghorn sculpin
Pacific tomcod
Northern midshipman
Topsmelt

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[2] Aplin, A., San Francisco Bay Study, Menlo Park, 1963; and Skinner, J. E., An Historical Review of the Fish and Wildlife Resources of the San Francisco Bay Area, 1962

[3] Aplin, A., San Francisco Bay Study, Menlo Park, 1963

California tonguefish
American shad
Pile perch
Starry flounder
Bat ray
Brown smooth hound shark
Spiny dogfish shark
Leopard shark

The grazing filter-feeders that depend on plankton are at the top of the list, while large predator types such as sharks are at the bottom, thus exemplifying the typical pyramid of numbers in a predator food chain. In the northern bays the striped bass would be included well up the list because of its great abundance.

The major type of bird using the shallow waters dives for food. Some catch food near the surface: pelicans and terns. Others dive into water several feet: loons, grebes, and mergansers. The diving ducks go all the way to the bottom to feed in the mud.[4] Some of the common birds of the shallow waters are listed below:

- Diving fish-feeders

  Western grebe
  Eared grebe (often eat feathers)
  Red-throated loon
  Double-crested cormorant
  Red-breasted merganser

- Diving ducks

  White-winged scoter
  Surf scoter
  Greater scaup
  Lesser scaup
  Canvasback
  Ruddy duck

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4 Sibley, C.G., The Birds of the South San Francisco Bay Region, San Jose, 1952

- <u>Surface feeders</u>

  Brown pelican
  Caspian tern (nests along Bay)
  Forster's tern (nests along Bay)
  Least tern (endangered species — nests along Bay)
  Gulls (five species)

Mammals of the shallow waters are relatively sparse; only the harbor seal and the sea lions can be called common. Porpoises sometimes find their way into San Francisco Bay. Some 300 to 400 harbor seals live in the Bay and require hauling out areas along the shore for resting.

Mud flats are an extensive feature of San Francisco Bay and cover tens of thousands of acres. The flats are substrate that may have a moisture content of close to 75 percent by weight. They serve as a surface on which many microorganisms such as blue-green algae diatoms and nematodes may abound. A variety of invertebrates (annelid worms and clams) thrive in the mud and are in turn fed upon by various shorebirds when the flats are exposed; when the tide is in, diving ducks and fish find nourishment there. Thus, this unique surface serves both essentially terrestrial organisms — the shore birds — and aquatic forms — the ducks and fish, both finned and shell. The fish, of course, are restricted to the shallow water over the flats and are identified under that habitat.

Various algae, both unicellular and multicellular, live on the mud flats. Diatoms and blue-greens represent the former while green algae, e.g., sea lettuce (Ulva sp.), and red algae represent the latter.

Over 100 species of invertebrates have been collected from San Francisco Bay muds. Some of the more important ones are listed below:

Roundworms or nematodes
Ribbon worms or nemerteans

Segmented worms or annelids
- (Neanthes succinea)
- (Nercis diversicolor)

Crustaceans
- Barnacles (Balanus spp.), not living in the mud but on nearby objects
- Shore crabs (Hemigrapsus spp.)
- Commercial crab (Cancer magister)

Molluscs
- California horn snail (Cerithidea californica)
- Moon snail (Polinices Lewisi)
- Mud snails (Nassarius mendicus)
- Sea slugs or nudibranchs
- Bay mussel (Mytilus edilis)
- Ribbed mussle (Modiolus demissus)
- Oysters (various genera)
- Bent-nosed clam (Macoma nasuta)
- Soft shell clam (Mya aranaria)
- Japanese littleneck clam (Tapes semidecussata)

Figure G-1 shows a generalized description of the water areas adjacent to the airport. Figure 2-6 shows a portion of the proposed wildlife refuge in San Mateo County as related to existing aircraft flight paths.

Wild plants and animals abound in the San Francisco Bay region; over a thousand different kinds of higher plants and several hundred birds and mammal species are present. If all the invertebrates were included, the list of animal species would probably run into the tens of thousands. Their sensitivity to noise and air pollution is essentially unknown.

A clear relationship between wildlife and aircraft noise and operations has not been established. Information is only recently becoming available on the effects of sound on living organisms. One report indicated an increased wheat plant size when the plants were subjected to sound frequencies between 5,000 and 300,000 cycles per second.

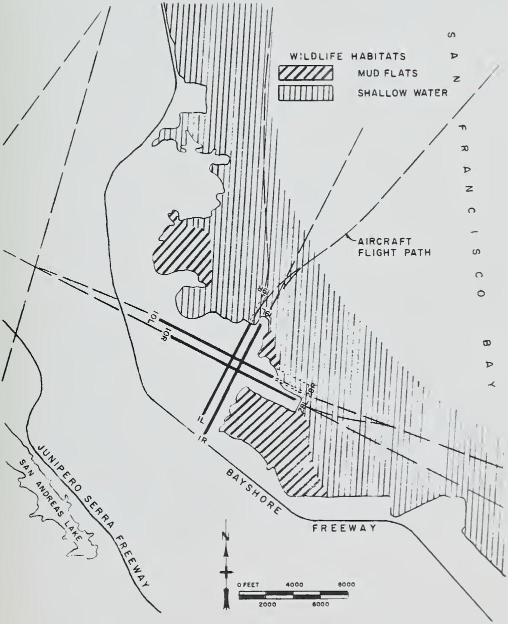

Figure G-1. Wildlife Habitats near San Francisco International Airport

An evaluation of the impact of the airport expansion on wildlife cannot be made in a quantitative manner. However, it is shown elsewhere in this environmental impact statement that air pollution is expected to decrease compared to 1970 levels, noise is expected to be less compared to 1970 levels, and waste discharges will be "cleaner" compared to 1970 levels; thus, the 1985 environment will be better than that of 1970.

APPENDIX H

APPENDIX H

WATER QUALITY

The San Francisco International Airport discharges effluent into the Bay from three sources: a sewage treatment plant, and two systems of combined storm drain and industrial treatment.

A sewage treatment plant was constructed recently. The Expansion Program will provide for cleaner water being discharged into the Bay. This program will include an industrial waste treatment plant.

These projects, together with some support facilities, will treat water more completely than has been done heretofore.

Present facilities consist of:

- Sewage. A new 2.2-million-gallon-per-day (average) sewage treatment plant at the north edge of the airport property.
- Industrial Waste. Source control by means of separators at the tenants' facilities followed by two oxidation ponds for detention of effluent for 13 days (North Pond) and 7 days (South Pond).

Present water quality is in compliance with State water quality standards, exception for toxicity in sewage treatment and toxicity in industrial wastes. The toxicity test requires a stickleback fish to survive in test waters for 96 hours.

Table H-1 shows a detailed comparison of sewage test results and the corresponding standards. All standards were in substantial compliance for the year except for toxicity. The toxicity test is difficult to perform because the fish may die from causes unrelated to water quality, such as sudden temperature changes, inadequate oxygen during shipment of fish, etc. The environmental impact statement for the South San Francisco deep water outfall indicated that using a brackish water fish (the stickside)

may be overly conservative for salt waters, since saltwater species seem not to be affected as much by foreign substances as brackish-water fish.

Table H-1

SAN FRANCISCO INTERNATIONAL AIRPORT
WATER QUALITY CONTROL PLANT
SEWAGE TREATMENT TEST RESULTS
(Sampling Period - August 1971 to September 1972)

Receiving Waters (Bay)

Parameter	Test Results				State Requirement Resolution No. 70-12	Percentage In Conformance
	Minimum	Maximum	Average	Median		
Dissolved oxygen	5.5	13.5	9.2	9.[illegible]	[illegible] 5.[illegible]	[illegible]
pH	7.1	8.4	7.8	8.1	7.0 to 8.5	100
Dissolved sulfides	0	0	0	0	maximum 0.1	100

Parameter	Number of Days Observed	Number in Violation	Percentage In Conformance
Floating solids	284	[illegible]	100
Floating oil	284	0	100
Discoloration	284	0	100
Odor	284	0	100

Waste Stream (Effluent From Plant Before Entering Bay)

Parameter	Test Results				State Requirement Resolution No. 70-12	Percentage In Conformance
	Minimum	Maximum	Average	Median		
Coliform	2	1,400	94	23	230 MPM	[illegible].5
Toxicity (96-hr survival)						
Undiluted	0	100%	29%	5%	90%	20
TLm	[illegible]	100%	75.6%	[illegible]		
Biochemical oxygen demand removal	72.5%	97.7%	92.5%	95%	90%; or 80% in two consecutive samples	100
Settleable matter (ml/L/1 hr)	0	0.5	0.1	0.1	0.5	[illegible]

Source: San Francisco International Airport Engineering Division

Tables H-2 and H-3 show detailed comparisons of industrial waste treatment test results and the corresponding standards. Data are shown separately for the North Pond and the South Pond. The results show that in all cases the ponds were in substantial compliance with standards over the 20-month period ending in September 1972.

Table H-2

SAN FRANCISCO INTERNATIONAL AIRPORT
DRAINAGE STATION NO. 1 – SOUTH OXIDATION POND
INDUSTRIAL WASTE TREATMENT TEST RESULTS
(Sampling Period – Monthly, January 1971 to September 1972)

Parameter	Units	Test Results: Minimum	Maximum	Average	Median	[illegible] Resolution No. 692[a]	[illegible]
Grease	mg/L	5.7	[illegible]	12.9	11.0	[illegible]	--
Phenols	mg/L	0.02	0.76	0.19	0.08	[illegible]	--
Cyanide	mg/L	<0.06	<0.06	<0.06	<0.06	[illegible]	[illegible]
Cadmium	mg/L	0.02	0.20	0.04	0.02	[illegible]	[illegible]
Total Chromium	mg/L	[illegible]	[illegible]	0.03	[illegible]	[illegible]	[illegible]
Copper	mg/L	0.02	0.05	0.03	0.02	[illegible]	[illegible]
Lead	mg/L	0.02	0.17	0.04	0.03	[illegible]	[illegible]
Nickel	mg/L	0.02	0.08	0.03	0.02	[illegible]	[illegible]
Silver	mg/L	0.02	0.05	0.03	0.02	[illegible]	[illegible]
Zinc	mg/L	0.02	1.0	[illegible]	[illegible]	[illegible]	[illegible]
pH	mg/L	6.8	10.2	7.9	7.8	[illegible]	[illegible]
Settleable Solids	ml/L/1 hr	0.0	0.2	0.1	0.1	[illegible]	[illegible]
Bio-Assay (% survival in 96 hr)		0	100	[illegible]	[illegible]	[illegible]	[illegible]

[a]Resolution 692, California Regional Water Pollution Control Board No. 2, [illegible], August 1?, 1965.

Source: San Francisco International Airport Engineering Division

Table H-3

SAN FRANCISCO INTERNATIONAL AIRPORT
DRAINAGE STATION NO. 2 — NORTH OXIDATION POND
INDUSTRIAL WASTE TREATMENT TEST RESULTS
(Sampling Period — Monthly, January 1971 to September 1972)

Parameter		Test Results				State Requirement Resolution No. 692	Percentage In Conformance
		Minimum	Maximum	Average	Median		
	Units						
Grease	mg/L	3.9	18	10.1	9.0	20	100
Phenols	mg/L	0.01	0.75	0.18	0.12	0.50	94.75
Cyanide	mg/L	0.06	0.12	0.06	0.06	1.0	100
Cadmium	mg/L	0.02	0.19	0.05	0.03	1.0	100
Total Chromium	mg/L	0.02	0.48	0.09	0.08	2.0	100
Copper	mg/L	0.02	0.13	0.03	0.03	0.26	100
Lead	mg/L	0.02	0.15	0.05	0.03	0.10	85
Nickel	mg/L	0.06	0.28	0.11	0.10	Not specified	100
Silver	mg/L	0.02	0.07	0.03	0.02	1.0	100
Zinc	mg/L	0.02	1.0	0.19	0.09	1.0	100
pH	mg/L	6.9	8.4	7.9	8.0	6.5 to 8.5	100
Settleable Solids (ml/L/1 hr)		0.0	0.1	0.1	0.1	0.5	100
Bio-Assay (% survival in 96 hr)		0	100	92	99	90 Min.	89.5

Source: San Francisco International Airport, Engineering Division

The forecast of future water quality standards applicable to the airport was based on Interim Water Quality Control Plan for the San Francisco Basin, California Regional Water Quality Control Board, June 1971. The policy guidelines and objectives contained in this basic reference are recognized as being imprecise and subject to quantitative definition. However, to provide a basis for Phase II expansion requirements, the firm of Metcalf and Eddy, Palo Alto, was retained by the airport to assist in forecasting what the water quality standards would be and to relate these projected standards to facility requirements. The additional effluent control facilities shown in the Phase II plan are the result of this study.

Since the development of the effluent facility plan for Phase II, the Federal Government enacted the Federal Water Quality Control Act of 1972. Future standards for water quality in the airport region are uncertain. Title III of the Act applicable to the airport provides that point sources "shall require application of the best practicable control technology currently available as defined by the Administrator." And by July 1, 1983, Title III requires effluent limitation for categories and classifications of point sources that "shall require application of the best available technology economically achievable... which will result in reasonable further progress toward the national goal of the elimination of all pollutants."

The Act requires local cognizant authorities to submit standards and implementation plans to achieve the goal set out in the Act. These local water quality requirements have yet to be developed for public hearings and enactment. The outlook, however, is for progressively more stringent standards from the present through 1985.

Since the State of California has already moved aggressively in the field of water quality management, the impact of the Act on present standards and the timetable for new standards may not prove to be substantial. Considerable study was involved in preparing the Interim Water Quality Control Plan for the San Francisco Bay Basin.

In summary, the present effluent treatment facilities are in substantial compliance with State requirements for water quality, with special control procedures needed from time to time to meet exceptions.

The sewage and industrial waste facilities under the Phase II expansion were designed to meet presently forecast requirements of the cognizant State Water Quality Control Board. However, the impact of the Federal Water Quality Control Act of 1972 is yet to be determined and Phase II water treatment facilities and control procedures may require further augmentation to meet evolving new and more stringent standards brought about by this Act.

Pollution effects caused by aircraft at the ends of the runways are not expected to change because of the airport expansion. The runways, except for the paving of the extension of 28R, are to remain the same. The number of aircraft operations is to remain at nearly the same level as 1970.

APPENDIX I

STATE OF CALIFORNIA—BUSINESS AND TRANSPORTATION AGENCY RONALD REAGAN, Governor

DEPARTMENT OF PUBLIC WORKS

DIVISION OF HIGHWAYS

P.O. BOX 3366 RINCON ANNEX

SAN FRANCISCO 94119

April 17, 1973

Mr. William J. Dwyer
Director of Airports
San Francisco International
Airport
San Francisco, California 94128

Dear Mr. Dwyer:

We have reviewed your Draft Environmental Impact Report (DEIR) and offer the following comments to assist you in preparing your final EIR. Our comments concern Section 2n "Ground Transportation to the San Francisco International Airport."

Before discussing the effect of the Airport Expansion program on the Bayshore Freeway (Route 101) and the Portola Freeway (Route 380), we would like to discuss capacity. The capacities for freeway lanes and ramps listed in your report have been found to be too low for California conditions. A freeway lane in an urban area has been found to carry from 1800 to 2000 VPH; 1800 VPH is the figure the Division of Highways uses in its calculations. An on- or off-ramp can handle about the same as a freeway lane or about 1800 VPH. These values are for a level of Service "D". Level of service is a qualitative term from "A" to "F" describing any one of an infinite number of differing combinations of operating conditions that may occur on a given roadway when it is accommodating traffic volumes. At a level of Service "D" traffic operation approaches approximately 90% of capacity with speeds over 40 MPH. Level of Service "E" is capacity. Even though we designate a freeway to operate at some level such as "D", the road can actually operate at any level from "A" to "F" if the roadway alignment is adequate and enough traffic appears.

This means that an eight lane freeway can carry approximately 7200 VPH one-way (14,400 two-way) without congestion. Experience in District 4 has shown that daily traffic on an eight lane freeway can increase to about 180,000 cars per day before demand is constrained. These levels have been exceeded: Route 101 North of Army Street carries peaks of over 200,000 cars per day with a

peak hour two way volume of 15,000 VPH.

In the following discussion of the roads leading to and from the airport we are assuming that Interstate Route 380 is complete from Route 280 to the airport passenger terminal. The traffic generated by the airport facilities can be handled without congestion by the highways close to the airport. However, the projected number of vehicles anticipated during the peak hours will be subjected to congestion and delay at highway locations further from the airport. At these locations during peak hours both airport users and non-airport traffic can expect delay. The four areas that will meter or constrain the traffic bound for or leaving the airport during the peak hours are:

1. Route 101 south of Millbrae Avenue. Here the northbound a.m. and p.m. peak and southbound a.m. and p.m. peak hour traffic on Route 101 will be limited to approximately 7200 VPH.

2. Route 101 north of South Airport Boulevard. The northbound a.m. and p.m. peak hour traffic on Route 101 north of the South Airport Boulevard Interchange will be limited to approximately 7200 VPH.

3. The Route 380/280 Interchange. The westbound p.m. traffic on Route 380 will be delayed at the Route 380/280 interchange. Northbound and southbound movements onto Route 280 from Route 380 will be limited to approximately 3600 VPH per direction.

4. Route 280 between Sneath Lane and Westborough Boulevard. North and southbound p.m. peak hour traffic will be delayed.

Traffic will be constrained at these four locations. We do not have any projects currently planned for increasing the capacity of the Route 101 corridor north or south of the airport. The completion of Route 380 will allow full utilization of Route 101 and Route 280 as north-south routes but will not end the peak-hour congestion that will occur on Route 101 in the previously described locations during the morning and evening peak periods.

How much will the airport expansion affect Route 101 and the local highway system? Attached to this report is a map showing the predicted 1985 traffic demand on Route 101 and the highway system feeding the airport. Shown on the map are the total predicted 1985 traffic demands with airport expansion, without airport expansion and the capacities of the various roadways. In addition to the map, is a table showing the predicted 1985 peak hour demands for airport expansion and no airport expansion, excess demand beyond the capacity of the roadway and the percentage of the excess demand generated by the airport expansion.

The predicted traffic demands are based on the following:

1. The latest population figures (April 1972) for San Mateo County from the State of California Department of Finance. The predicted 1990 population for San Mateo County is 677,000.

2. A doubling of airport passengers will mean a doubling of vehicular traffic into and out of the airport.

3. No increase in transit facilities.

4. No major change in the timing of airport operations.

5. Peaks on each road occur at the same time.

It should be noted that the figures are unrestrained, that is, it is assumed that everyone can make a trip without delay at the time they wish. This analysis will give greater traffic volumes than can actually appear since capacity restraints will force a diversion of trips in time or route. This analysis is useful to show the effect of the airport expansion on the demand for highway space.

It should be noted that between Route 101 at Colma Creek and Route 101 at Millbrae Avenue no capacity or demand figures are shown for Route 101. This is because the capacity of this section will not be exceeded by demand. The attached map and table shows that there will be six probable locations where delay and congestion will occur on the highway system feeding into and out of the San Francisco International Airport. In three of these areas, congestion will occur whether the airport expands or not. During the peak hours there will not be enough capacity on the highway system to handle the traffic bound for the airport if present trends continue. However, there is sufficient capacity available throughout the day to service the airport if people are willing to schedule their trips at times other than during the peak hours.

Route 101

Route 101 will be the highway most affected by the increase in traffic caused by the airport expansion since sections of Route 101 are at capacity now during the peak hours. The additional airport traffic will increase the demand traffic in excess of capacity on sections of Route 101 by 15% to 40% during the peak periods. 1985 traffic demand with airport expansion shows approximately 204,000 vehicles per day (VPD) wanting to use Route 101

south of Millbrae Avenue. This is over the 180,000 VPD capacity of an average four lane freeway. Route 101 north of this area in San Francisco does handle 200,000 VPD so that this volume is possible.

However, Route 280 has additional capacity in the peak and off peak areas which will attract traffic away from Route 101. But it will not completely relieve the peak hour congestion on Route 101 in this location.

Congestion on Route 101 north of Colma Creek will occur. Airport traffic would be able to divert to San Francisco via Route 280 and thus have a lesser impact on Route 101 than is shown in the table.

Route 380

The westbound evening demand traffic will exceed the roadway capacity by 7%. Minor congestion and delay will occur but will not be significant.

Route 280

The capacity of Route 280 between Sneath Lane and Westborough Boulevard will be exceeded both northbound and southbound during the evening peak hour (5 to 6 p.m.). Adequate capacity will exist both north and south of this section. Construction of State Route 380 between Route 280 and Route 35 will relieve this congestion. If State Route 380 is not constructed, additional lanes on Route 280 could be required. Also, metering of traffic entering Route 280 from Sneath Lane, San Bruno Avenue and Westborough Boulevard would relieve the congestion.

Local Roads

Local Roads will not experience any substantial increase in traffic because of the access to the airport available from Route 380 and Route 101. Route 380 will be able to handle the predicted demand with only minor congestion west of El Camino Real. San Bruno Avenue will experience a minor increase but total traffic will only be a third of what uses it today. Millbrae Avenue will not be affected. Streets such as El Camino Real paralleling Route 101 between 3rd Avenue and Millbrae Avenue will experience increases in traffic but this will be local traffic which would have used Route 101 for short trips. El Camino Real because of the existing development and signalized intersections is not a feasible alternative for longer trips and any impact from airport expansion would be minimal.

If congestion is going to occur on Route 101, what can be done to mitigate its effects? What can the airport do to mitigate the effects of its expansion on the highway system? There are at least seven possible courses of action. These are:

1. Do nothing
2. Increase roadway capacity
3. Meter Freeway on-ramp traffic
4. Alternate Modes of Transportation
5. Off Site Parking
6. Rescheduling of airport operations
7. Combinations of the above

This list is not intended to be inclusive. Other courses of action could be suggested.

1. Do Nothing

This alternative means accepting the congestion that will occur and let each individual driver adapt to the situation. This will cause some drivers to reschedule their trips both in time and space. The peak period on Route 101 will lengthen and traffic on local streets in some areas paralleling the congested sections of Route 101 will increase.

2. Increase Roadway Capacity

This alternate would consist of adding enough lanes to Route 101 both north and south of the Airport. The cost of such an expansion would be in the millions. No additions would be necessary on Route 380.

3. Meter Freeway On-Ramp Traffic

A third alternative would be to meter the traffic entering Route 101. In effect this consists of regulating the number of vehicles which can enter the freeway at on-ramps in order to maintain inflow at or slightly below the capacity of the freeway. Delay is spread over all users of the roadway with delay and congestion being reduced.

4. Alternate Modes of Transportation

This alternative would consist of providing other modes of transportation and upgrading existing modes besides the automobile for access to the airport. This could be bus, upgraded Southern Pacific or BARTD.

5. Off Site Parking

This alternate would consist of off site parking near congested sections of freeway with transit to the passenger terminal. This would be used to supplement Route 101.

6. Rescheduling of Airport Operations

Airport operations could be rescheduled so that the airport peak hours will coincide with the off peaks on Route 101 when sufficient capacity is available.

7. Combinations of the Above

This alternate would consist of two or more or all of the previously mentioned alternatives.

There is no discussion in the DEIR of the effects on the freeway system of the three alternatives mentioned in Section 5. All presume an increase in air passengers. If no increase occurs it is probable none of the four proposals with the possible exception of a new airport somewhere will affect the freeway system. If the increase does occur, then all alternatives will affect the freeways.

If nothing is done while passenger demand increases, passengers may still try to use the San Francisco International Airport and the same problems that would accompany the airport expansion would occur. The extent of the effect depends on how many passengers the airport could handle now and how much delay and congestion at the airport passengers would be willing to accept. A portion of the increase would probably divert to Oakland or San Jose. Currently traffic coming to the airport is split evenly between north and south. Therefore, depending on what routes passenger traffic would use to get to the other airports, the same areas on Route 101 would be affected, the Bay Bridge, Route 17 and Route 92.

Expanding other airports in the Bay Area and constructing a new airport would have the same effects. However, we can't judge these effects since not enough information is available on the alternatives listed. All alternatives except no increase in air passengers will result in delay and congestion on portions of the freeway system in the Bay Area. As to which alternative would cause the least delay and congestion, more detailed information on each alternative is needed plus the time required to study each one.

Attached is a table showing our latest traffic counts on Route 101. These counts list the peak hour traffic into or out of the airport and may be of assistance to you. If you need any further information or assistance, please call W. J. Zenoni at 557-0585.

Yours very truly,

T. R. LAMMERS
District Engineer

By

W. J. Zenoni
Assistant District Engineer

Attach

ROUTE 101 TRAFFIC

FROM AIRPORT

Location	ADT	AM Peak	%	PM Peak	%
Terminal to Route 101 Southbound	11,500	500	4.3	1100	9.6
Terminal to Route 101 Northbound	15,000	700	4.7	1200	8.0
Northbound San Bruno Ave. to Route 101	4,500	700	15.5	300	4.5
Southbound San Bruno Ave. to Route 101	4,070	400	9.8	700	17.2

Current (1971) Route 101 Traffic

ADT	- 137,000	Peak ADT	- 147,000
Peak Hour	- 13,000	PM Peak (one-way)	- 6,600
		AM Peak (one-way)	- 6,100

TO AIRPORT

Location	ADT	AM Peak	%	PM Peak	%
Northbound Route 101 to Terminal	13,500	1,100	8.2	800	5.9
Southbound Route 101 to Terminal	12,000	1,000	8.3	800	6.7
Northbound Route 101 - San Bruno Avenue	5,260	970	18.4	670	12.7
Southbound Route 101 - San Bruno Avenue	2,000	300	15.0	200	10%

1985 PREDICTED PEAK HOUR DEMAND TRAFFIC

LOCATION	PEAK HOUR TRAFFIC DEMAND WITH EXPANSION		PEAK HOUR TRAFFIC DEMAND WITHOUT EXPANSION		EXISTING PEAK HOUR TRAFFIC (1972)		CAPACITY 1985	EXCESS DEMAND WITH AIRPORT EXPANSION		EXCESS DEMAND DUE TO AIRPORT EXPANSION		EXCESS DEMAND DUE TO OTHER FACTORS		LOCATION
	A.M	P.M	A.M.	P.M.	AM	PM		AM	P.M	A.M (%)	PM (%)	A.M (%)	PM (%)	
NORTHBOUND ROUTE 101 SOUTH OF MILLBRAE AVE	11,000	8000	9600	7400	7300	4900	7200	3800	80[illegible]	38%	19%	62%	81%	NORTHBOUND ROUTE 101 SOUTH OF MILLBRAE AVE
SOUTHBOUND ROUTE 101 SOUTH OF MILLBRAE AVE	9000	12,000	8,000	11,000	4200	7700	7200	1800	4800	21%	23%	79%	77%	SOUTHBOUND ROUTE 101 SOUTH OF MILLBRAE AVE
NORTHBOUND ROUTE 101 NORTH OF COLMA CREEK	10,100	9,100	9,600	8200	7200	3600	7200	2900	1900	17%	16%	83%	84%	NORTHBOUND ROUTE 101 NORTH OF COLMA CREEK
WESTBOUND ROUTE 380 WEST OF EL CAMINO REAL	5100	7700	4700	6400	ϕ	ϕ	7200	ϕ	500	ϕ	UNKNOWN	ϕ	UNKNOWN	WESTBOUND ROUTE 380 WEST OF EL CAMINO REAL
NORTHBOUND ROUTE 280 NORTH OF ROUTE 380	6100	8100	5800	7300	3500	2800	7200	ϕ	900	ϕ	20%	ϕ	80%	NORTHBOUND ROUTE 280 NORTH OF ROUTE 380
SOUTHBOUND ROUTE 280 NORTH OF ROUTE 380	4800	7900	4200	7700	2800	3500	7200	ϕ	700	ϕ	20%	ϕ	80%	SOUTHBOUND ROUTE 280 NORTH OF ROUTE 380

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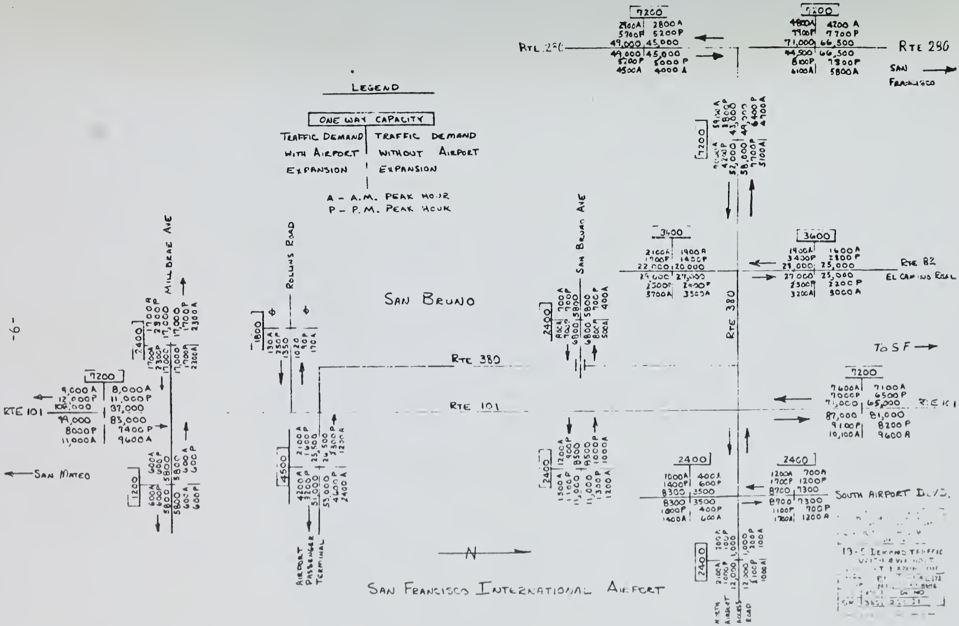

LEGEND
ONE WAY CAPACITY
TRAFFIC DEMAND WITH AIRPORT EXPANSION
TRAFFIC DEMAND WITHOUT AIRPORT EXPANSION
A - A.M. PEAK HOUR
P - P.M. PEAK HOUR
RTE 280
SAN FRANCISCO
RTE 82
EL CAMINO REAL
RTE 380
RTE 101
TO S F
SOUTH AIRPORT BLVD.
SAN BRUNO
SAN BRUNO AVE
ROLLINS ROAD
MILLBRAE AVE
SAN MATEO
AIRPORT PASSENGER TERMINAL
NORTH AIRPORT ACCESS ROAD
N
SAN FRANCISCO INTERNATIONAL AIRPORT

STATE OF CALIFORNIA—BUSINESS AND TRANSPORTATION AGENCY

RONALD REAGAN, Governor

DEPARTMENT OF TRANSPORTATION
District 04
P.O. Box 3366 Rincon Annex
San Francisco, CA 94119

July 17, 1973

Mr. Thomas G. Bertken
Deputy Director of Airports
San Francisco
San Francisco International Airport
San Francisco, CA 94128

Dear Tom:

The possibility of traffic from congested freeways diverting to local streets is contingent on many factors. First, there must be a local street approximately paralleling the freeway route. Second, there must be access to the local street from the freeway and from the local street back onto the freeway. Third, and most important, there must be a savings in time realized by using the local streets. Individual drivers may be influenced by other factors but the above three are critical.

In South San Francisco, we can find no local road which meets the above requirements. Therefore, we expect no diversion of traffic trying to bypass congestion from either Route 101, Route 280 or Route 380 onto local streets in South San Francisco.

In Burlingame, we found one local street that may provide an alternate route to Route 101. This is the Old Bayshore Highway east of Route 101 between Broadway and Millbrae Avenue. Traffic bound for the Airport may exit at Broadway and use Old Bayshore to the Terminal. We cannot predict how much traffic will divert. However, it will be limited to only a few hundred cars during the peak hours. There are no other streets in Burlingame which would provide feasible alternates to Route 101.